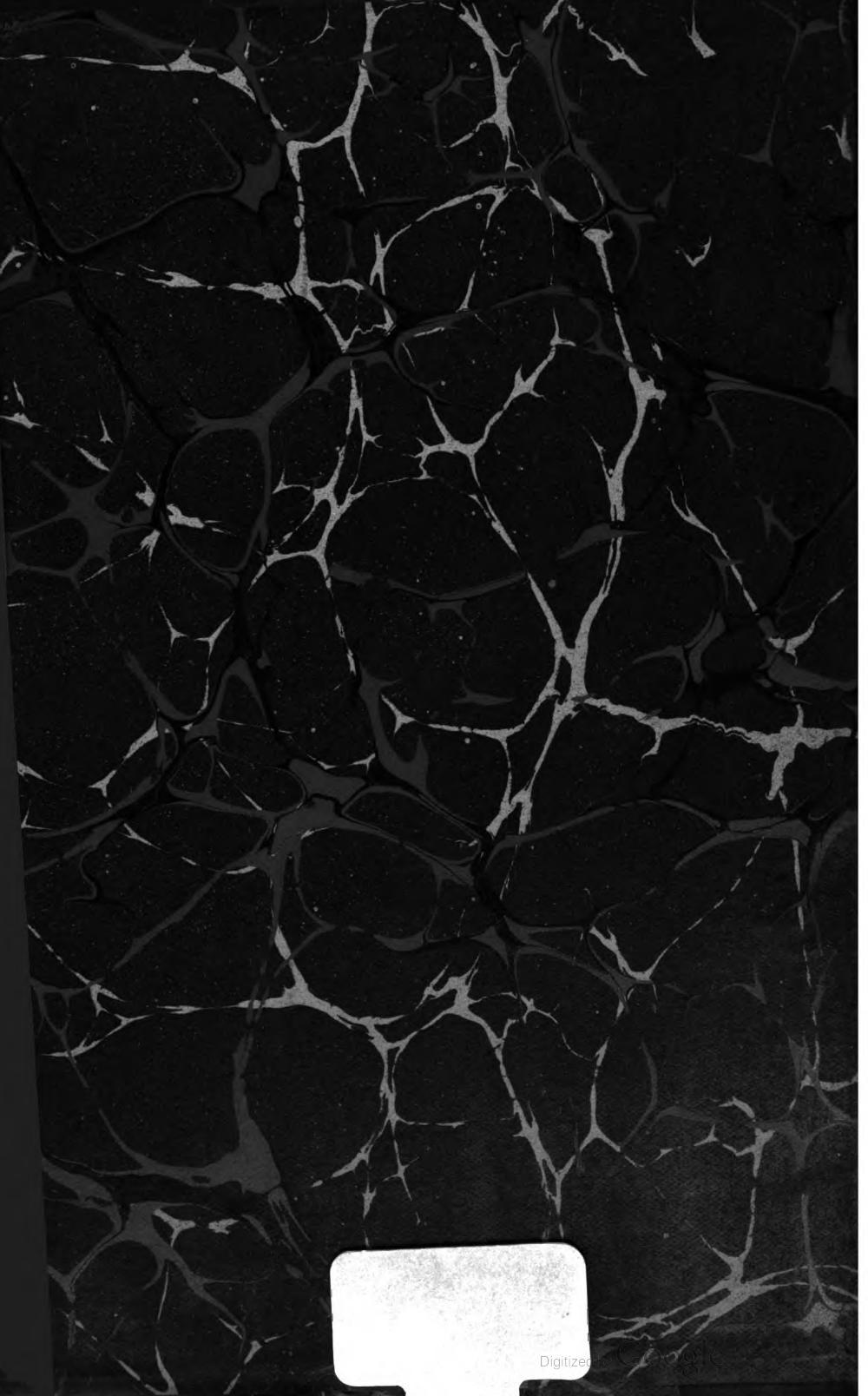

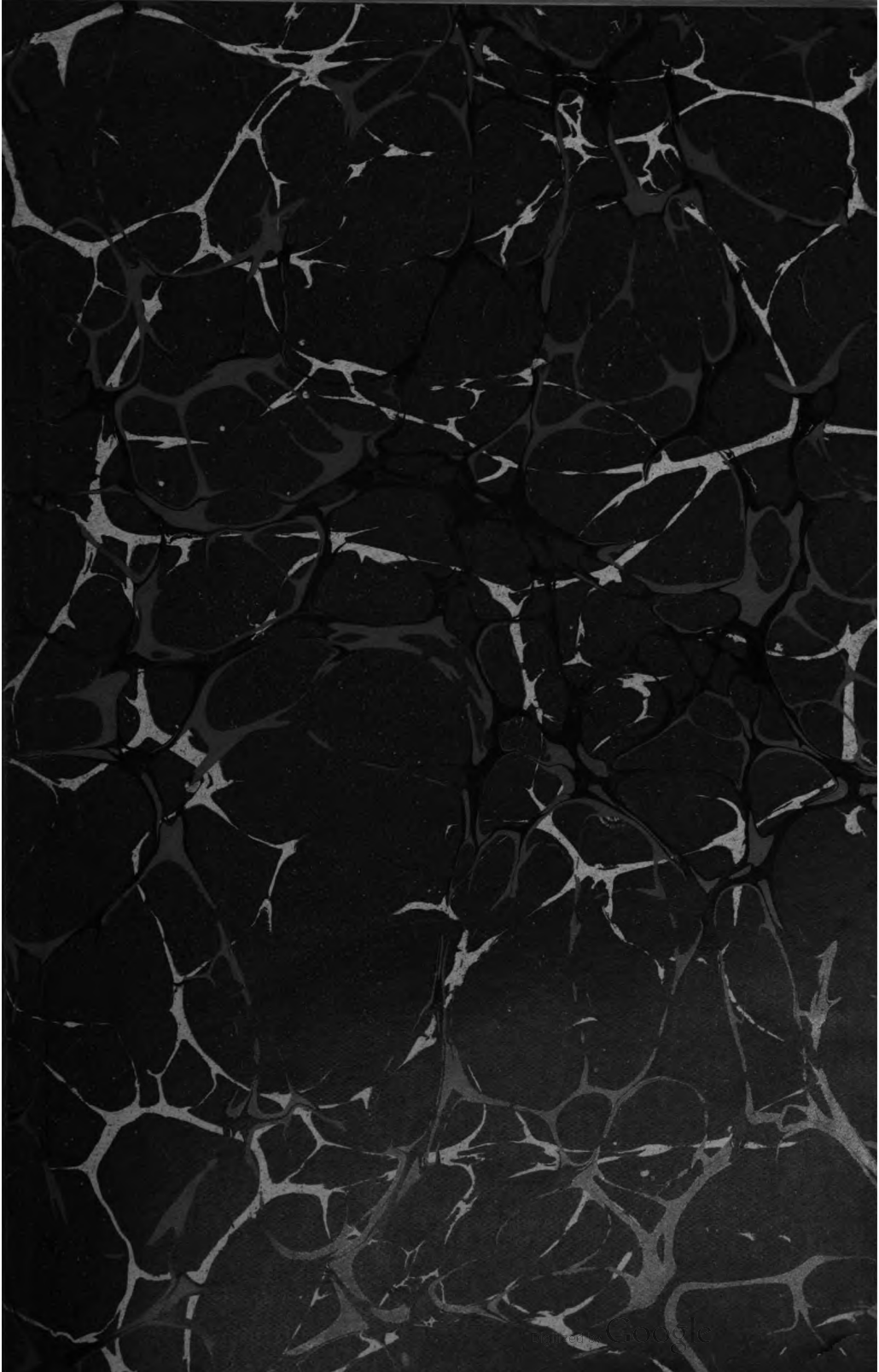

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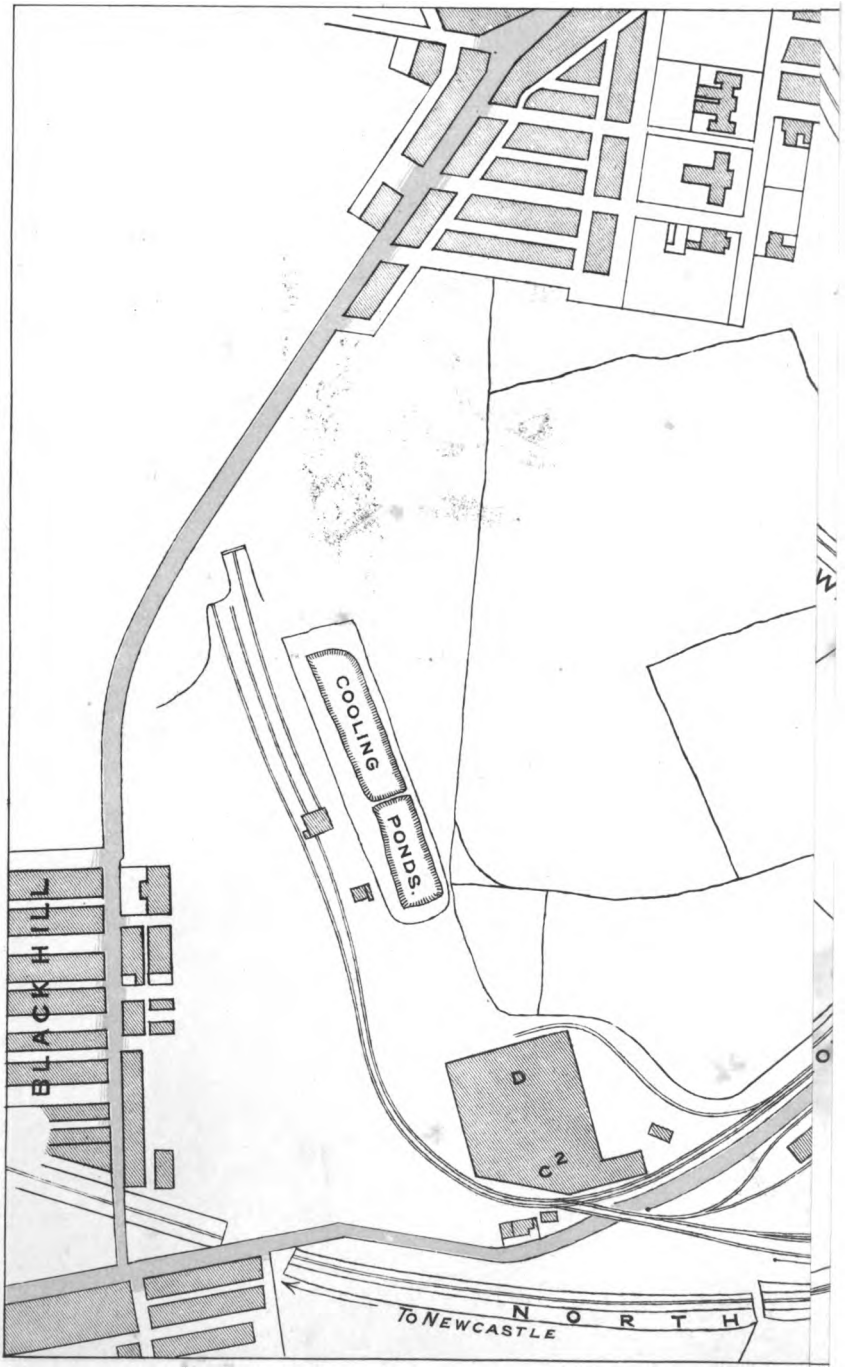
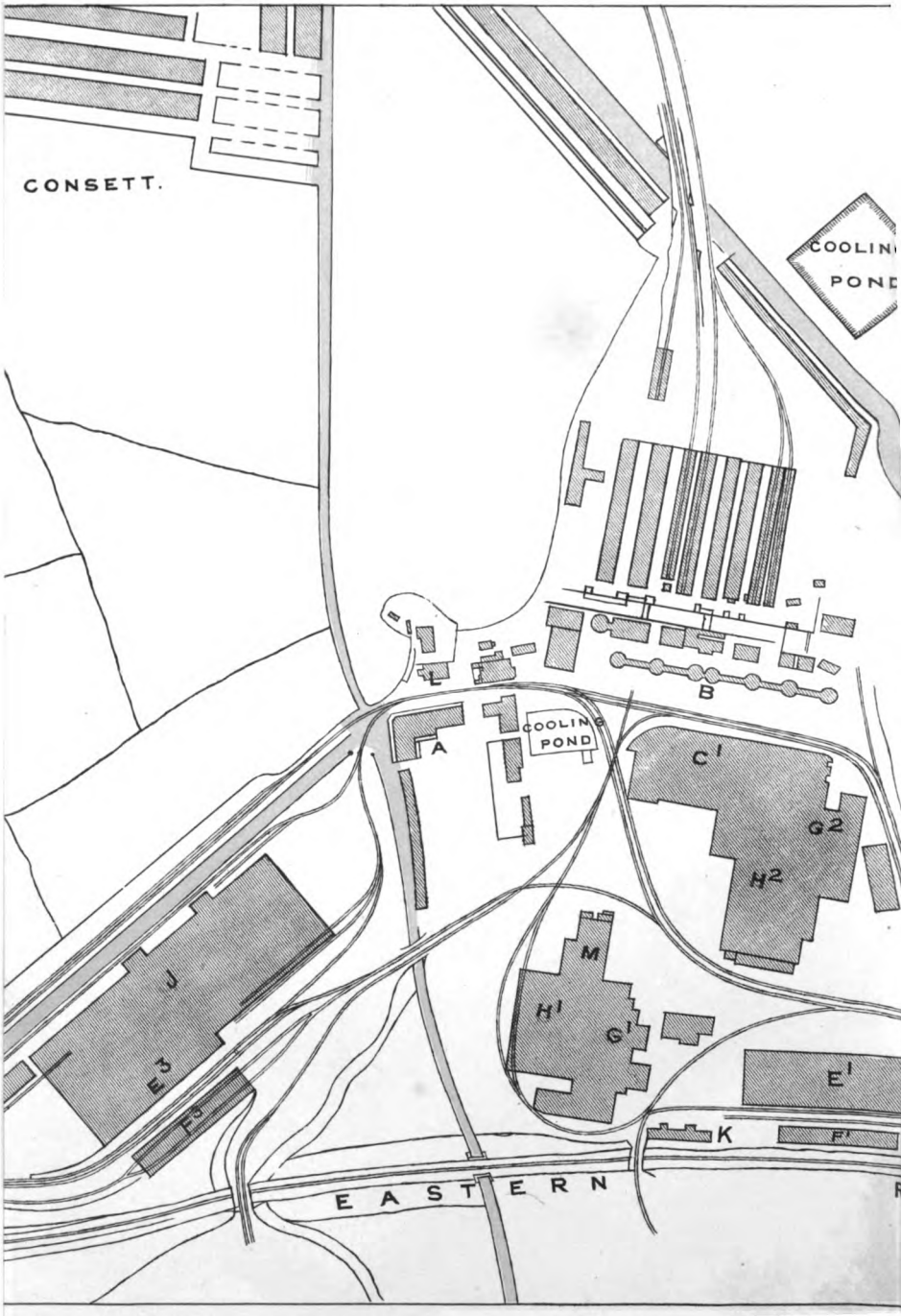
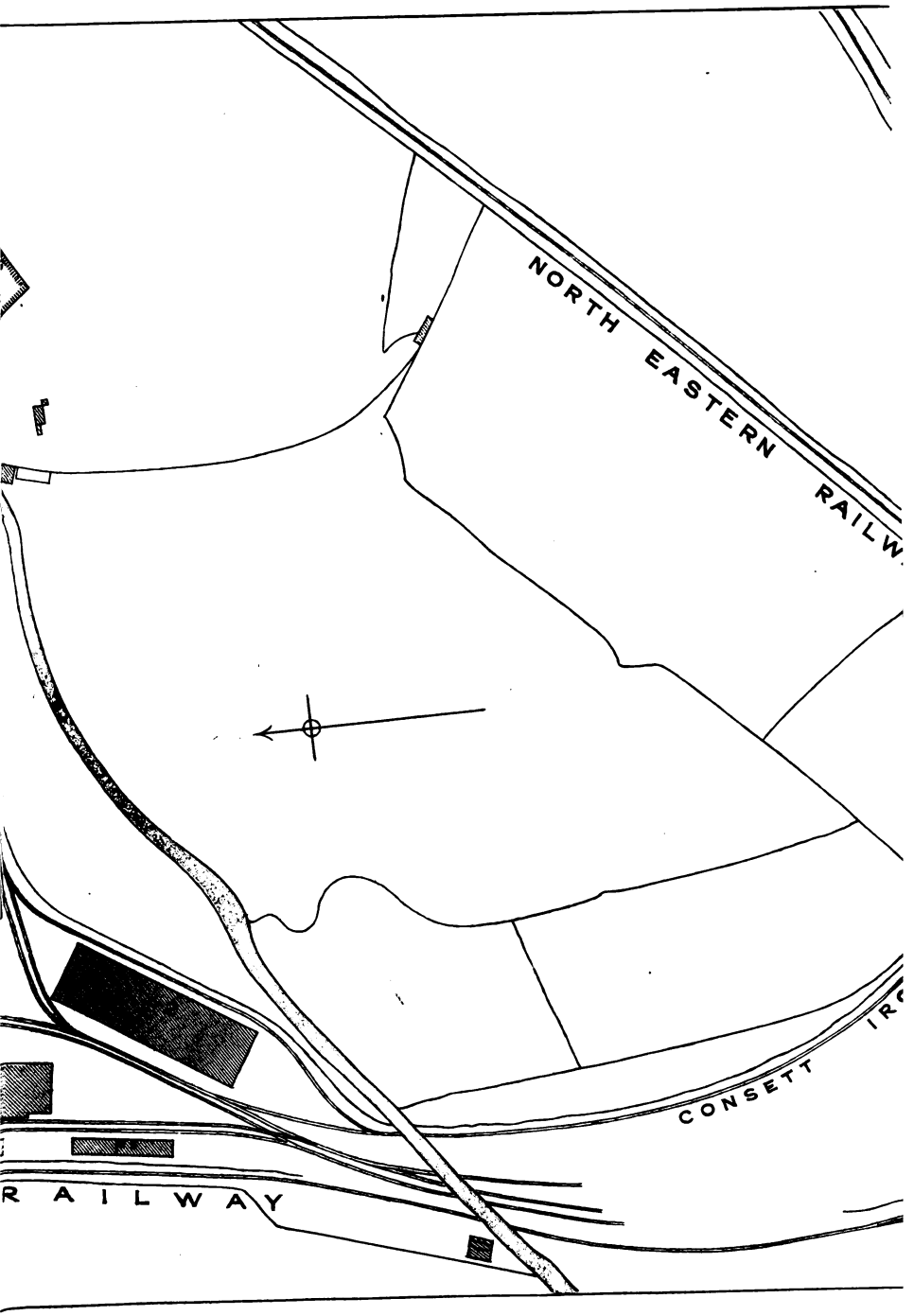


Hudson, Swan & Morgan, Newcastle on Tyne.



CONSETT IRON WORKS



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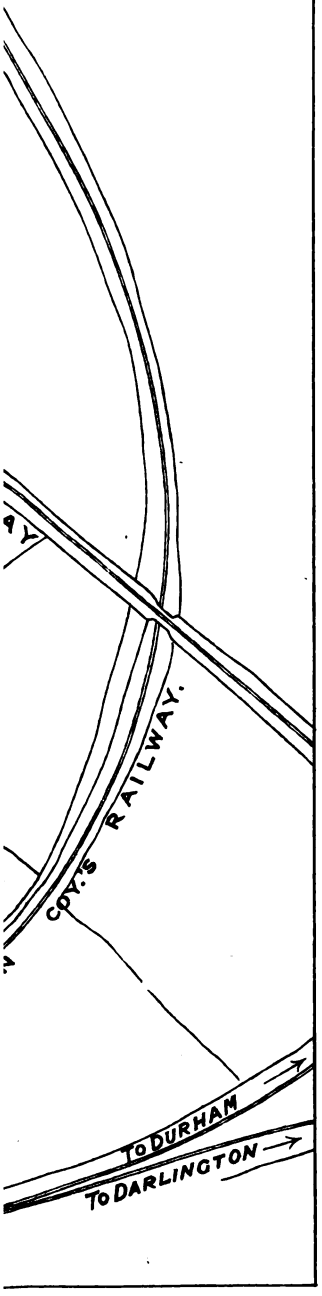

A GENERAL OFFICES
B BLAST FURNACES.
C1 PUDDLING MILLS (CONSETT.)
C2 „ „ (TIN MILL.
D MALLEABLE IRON PLATES (TIN MILL.)
E1 WEST MELTING SHOP.
E2 EAST „ „
E3 NORTH „ „
F1 GAS PRODUCERS (WEST SHOP.)
F2 „ „ (EAST SHOP.)
F3 „ „ (NORTH SHOP.)
G1 No. 2 STEEL COGGING MILL.
G2 „ 4 „ „ „
H1 Nos. 1 & 2 STEEL PLATE MILLS.
H2 „ 3 & 4 „ „ „
J ANGLE MILLS.
K TEST HOUSE
L LABORATORY.
M MECHANICAL ENGINEERING SHOPS.

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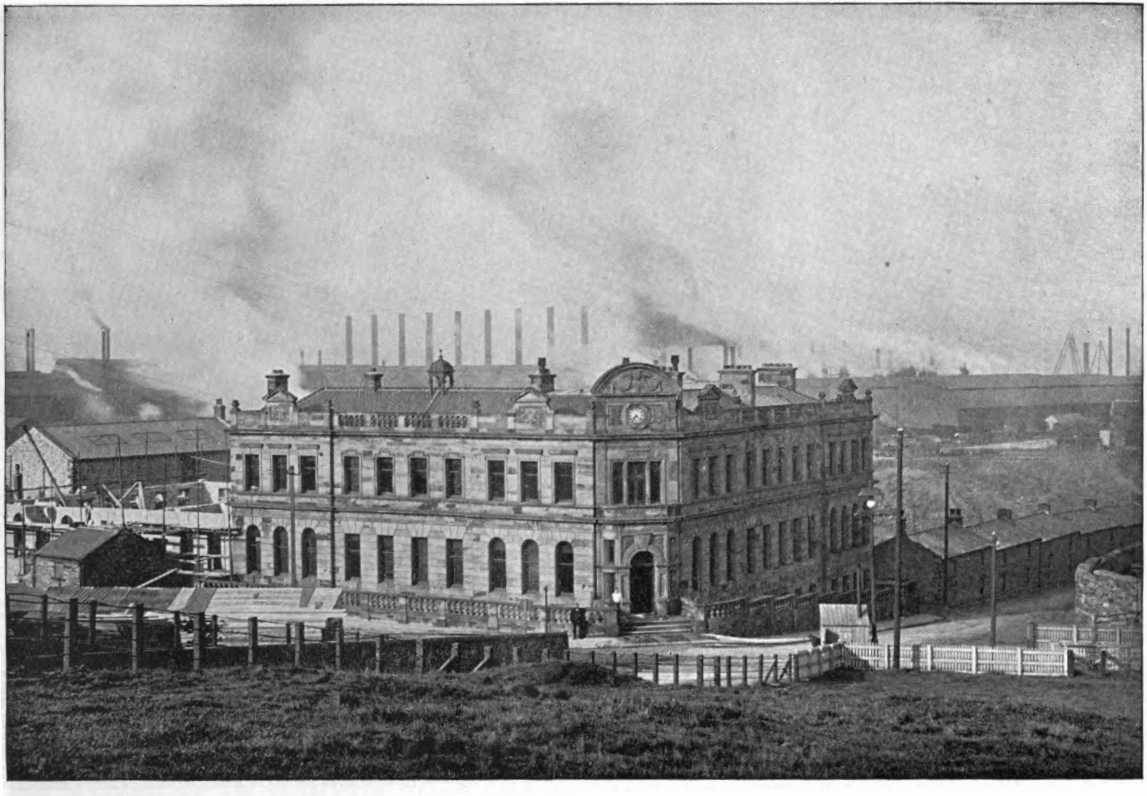


GENERAL OFFICES.

CONSETT IRON COMPANY

LIMITED.

DESCRIPTION

OF

THE WORKS.

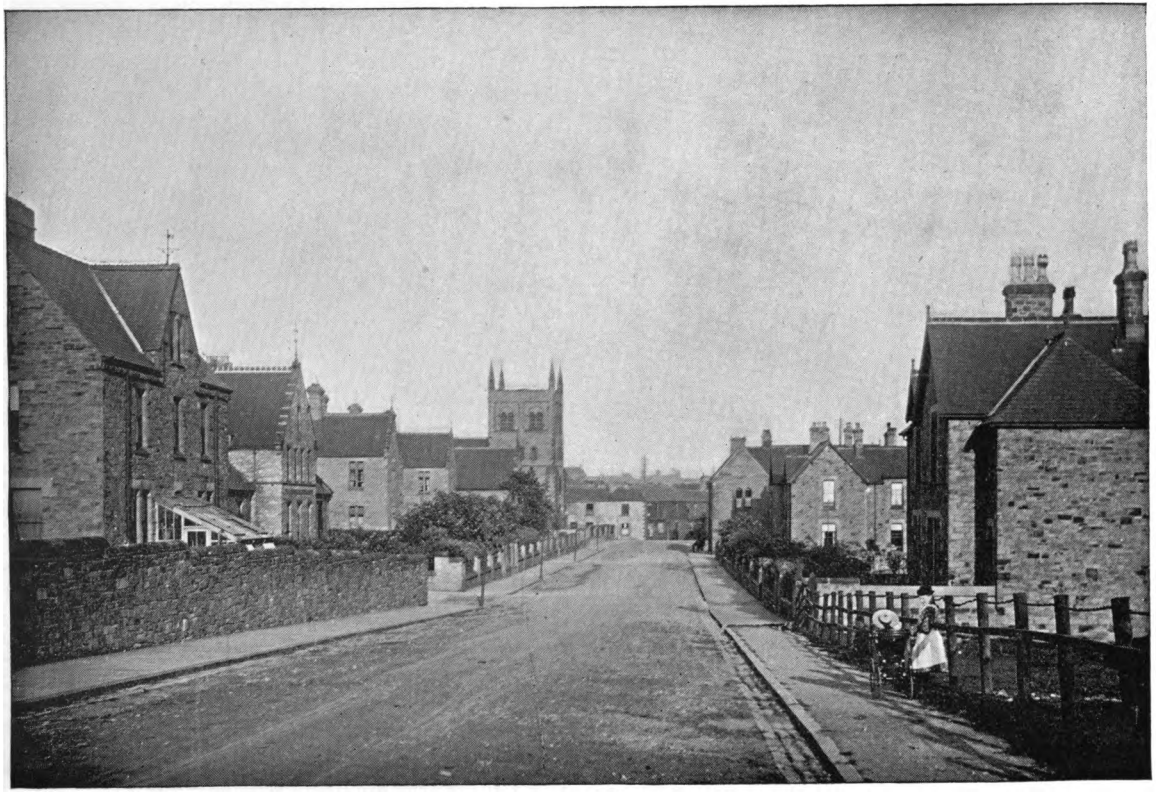
NEWCASTLE-ON-TYNE:
MAWSON, SWAN, & MORGAN.

—

1893.

THE position which Consett occupies in the iron and steel manufacture, its productions and capabilities, cannot fail to excite interest; and in view of this it is thought that the following attempt to describe the place may be acceptable to the members of the Iron and Steel Institute.

WILLIAM JENKINS.



CONSETT.

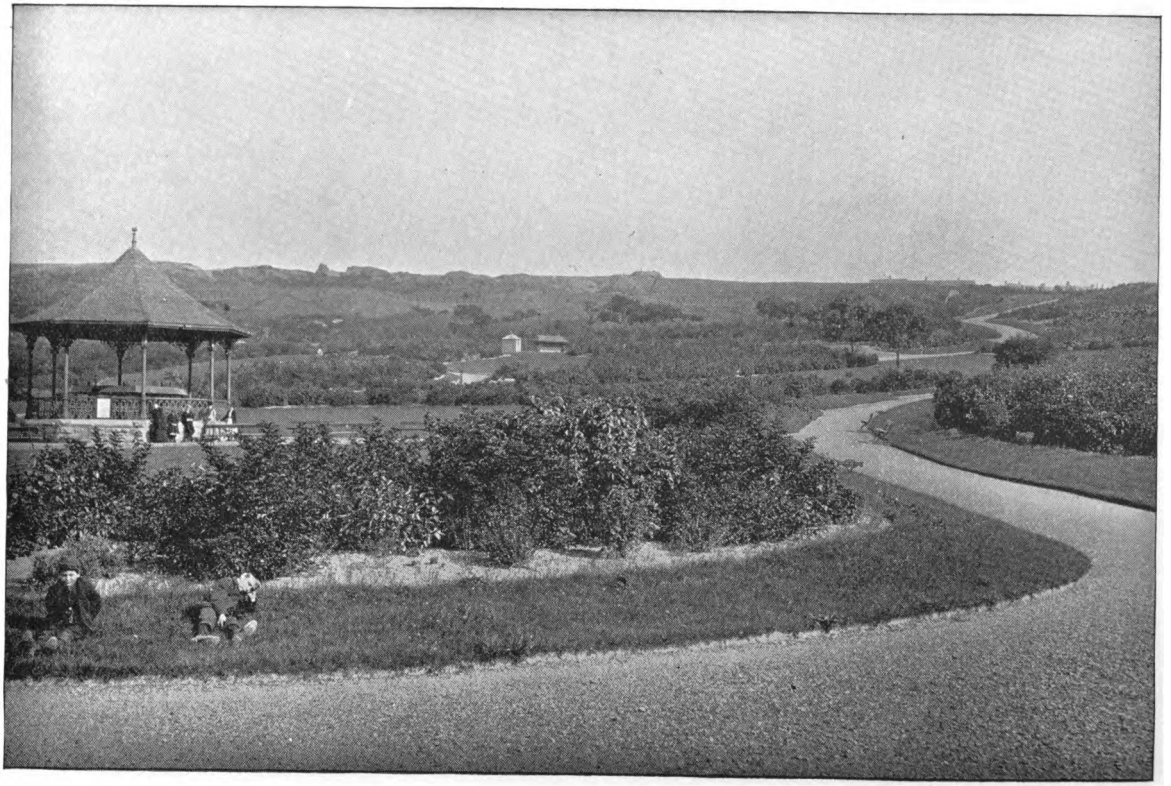
INTRODUCTION.

CONSETT is fourteen miles from Durham, and fifteen from Newcastle, and is approached from the first-named place by the Lanchester Valley Railway, and from the latter by the Derwent Valley Line. It has also direct railway communication with South Durham by the old Stanhope and Tyne Line, which was acquired by the Stockton and Darlington Company in 1844, and now forms part of the North-Eastern system. The Annfield Plain Railway to Birtley also intersects Consett, and will give the Company still further facilities for transit.

In 1837 the only habitations in the immediate neighbourhood of Consett were Delves House, Carr House, Barr House, a couple of thatched cottages in what is now known as Sherburn Terrace, and one or two buildings of a similar character. Three years later the Iron Works were started, and since then public buildings and streets of houses and business premises have sprung up all around, and what was once a bleak hill top is now a large and flourishing centre. Much money has been subscribed by the labouring classes for religious and educational purposes.

Standing at an altitude of upwards of 800 feet above the level of the sea, Consett commands a fine and extensive view of the surrounding country. Below its Park, and sheltered by its overhanging ridge of hills, lies the town of Blackhill, where not a house but one, that at Blackfine, existed sixty years ago. Immediately opposite, and rising with a gradual ascent, are the Northumberland hills, graced here and there with a variety of woodland. In the far distant north are the Cheviots, while westward the landscape is bounded by heather-clad hills. To the east of Consett, and overlooking the Lanchester Valley, is the town of Leadgate, chiefly inhabited by miners engaged at the Company's pits; and still further down the vale is the massive central tower of the grand old Cathedral Church of St. Cuthbert. Such is a bird's eye view of a group of places remarkable alike in growth and development.

Within the last three or four years, the Company have converted what was largely a piece of barren and waste land, situated between the towns of Consett and Blackhill, into a Public Park, for the use of the inhabitants generally. It has been tastefully laid out by Messrs. Robson and Sons, of Hexham, in a picturesque manner, and promises, when the numerous shrubs and trees become established, to be a boon to the district, and appreciated accordingly.



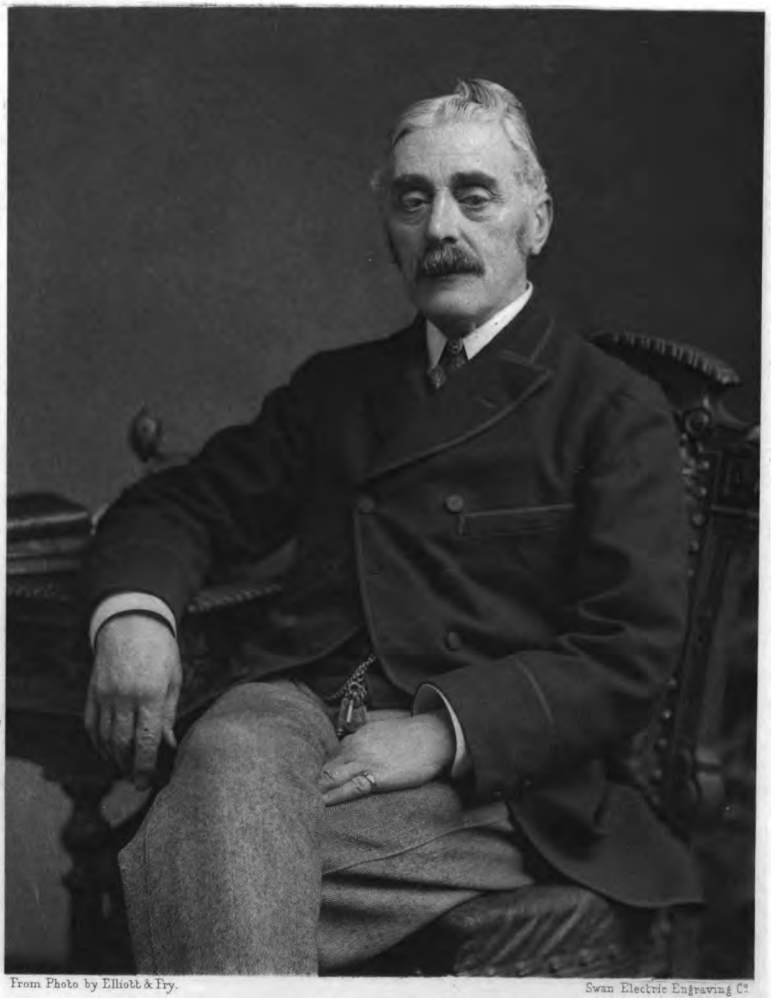
PARK.

EARLY HISTORY.

In the decade between 1830-40, the applicability of iron to innumerable purposes connected with the railway system gave an impetus to the iron trade; and it having been discovered that the local coal measures contained bands of ironstone, the establishment of Iron Works at Consett was decided on.

In 1840, a Company was formed under the title of the Derwent Iron Company, the late Mr. Jonathan Richardson being the principal promoter. Most of the ironstone in the district was leased, as were also several large royalties of coal. Blast-furnaces were erected, and rolling mills laid down, the ironstone for the former being obtained from shafts sunk in the immediate neighbourhood, the first being denominated Number One, by which name the locality is still known. After a time, however, it was found that the local ironstone was becoming scarce, and expensive to work, and eventually Cleveland had to be resorted to for supplies. The Company gradually extended their operations until they possessed eighteen blast-furnaces, seven of these being at Consett, while seven more had been erected at Crookhall, and four at Bradley, both these places being a little to the north-east of the main Works. In addition to the blast-furnaces, the Company had in operation at this time rolling mills, collieries, coke ovens, &c., and a large population had already

settled in the neighbourhood. In 1857, the stoppage of the Northumberland and Durham District Bank brought about a crisis in the affairs of the Company. It soon became known that they owed the Bank nearly a million pounds, and endeavours were immediately made to protect the Company's property for the benefit of the creditors. Subsequently the Works were disposed of to a number of shareholders of the Bank, who formed themselves into a Company, whose registered title was the Derwent and Consett Iron Company, Limited. But changes were not yet ended. The Company found themselves unable to complete the purchase as they had projected, and in the course of two years the property was again put up for sale, and was purchased by the present Consett Iron Company, Limited. The date of the formation of the Company was April, 1864. Amongst the property purchased were the Works at Consett, Crookhall, and Bradley, consisting of eighteen blast-furnaces, with puddling forges, extensive plate, angle and bar mills, and other adjuncts, producing 80,000 tons of pig iron per annum, and from 40,000 to 50,000 tons of finished iron. Five hundred acres of freehold land, attached to the Works, and more than a thousand freehold cottages, with manager's house and offices, were included in the purchase, which also embraced the transference of coal royalties well adapted for iron making. The capital of the Company was £400,000, divided into 40,000 shares of £10 each. The original directors were Messrs. H. Fenwick, M.P., Chester-le-Street; John Henderson, M.P., Leazes House, Durham;



From Photo by Elliott & Fry. Swan Electric Engraving Co.

J. E. Coleman, Tokenhouse Yard, London; J. W. Pease, Darlington; J. Fogg Elliott, Durham; Thomas Spencer, The Grove, Ryton; J. Norman Wilson, Sunderland; J. Priestman, Shotley Bridge; and David Dale, Darlington. Mr. Priestman was appointed Managing Director, which position he resigned in 1869. The only one of the above gentlemen still remaining a director is Mr. Dale, the present Chairman, whose connection with the concern dates back to the year 1857, having thus made up the long period of 36 years. He was appointed Managing Director in October, 1869, and in 1884, on the death of Mr. John Henderson, the then Chairman, he was appointed Chairman. In this way Mr. Dale's knowledge of the business and of the property of the Company is considerable, and it gives precision and promptitude at the directors' conferences and Board meetings.

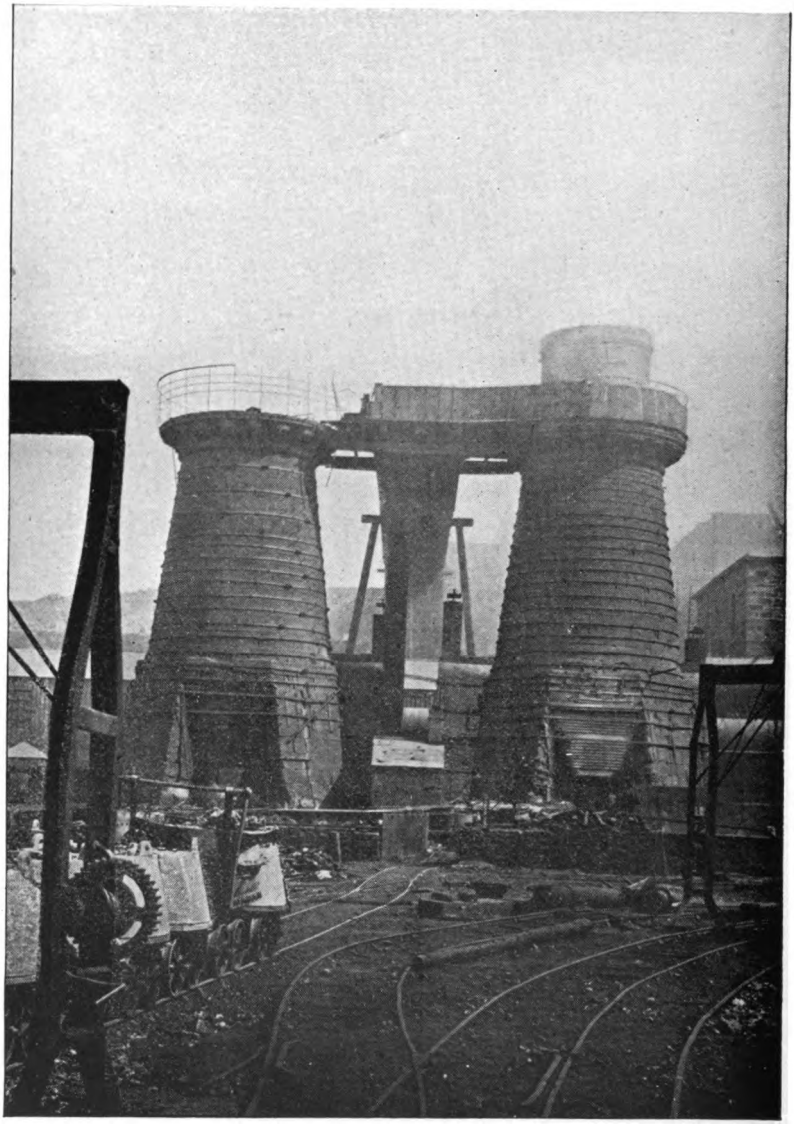
At the time of the formation of the present Company only six out of the eighteen blast-furnaces which they acquired were in blast, and there were at Consett ninety-nine puddling furnaces, besides thirty-one puddling furnaces at Bishopwearmouth Iron Works, which latter had been amalgamated with the Derwent Iron Company at an early stage of their career. To the north of the main Works were Tin Plate Mills, owned by Richardson & Co., and two years after the formation of the present Company they also acquired this property, by which they added to their plant twenty-seven puddling furnaces and three plate mills, together with a colliery which was much nearer the Works than their own pits. The ironworks at Bishopwearmouth

were soon dismantled and the operations concentrated at Consett, and the manufacture of tin plates was discontinued, and the Works utilized for the production of iron plates, although the name of the Tin Mill still clings to it, and is that by which this portion of the Works continues to be known.

COAL AND COKE.

Collieries.—The coal field possessed or held in lease by the Company extends over an area of 13,000 acres. At the present time they have in operation ten collieries, namely, Westwood, Medomsley, Derwent, Hunter, Eden, Blackhill, and Delves (all in the neighbourhood of Consett), two at Langley Park, near Durham, and one at Garesfield, from which latter coal is largely shipped on the Tyne. The usual annual output at these collieries has exceeded a million tons, but when the measures now in progress for opening out a large tract of untouched coal on the north side of the Derwent have been carried out, the production will probably reach one-and-a-half millions. This mineral property being adjacent to the outcropping of the Durham coalfield, the seams lie generally at a moderate depth from the surface, and, happily, they are therefore free from the presence of inflammable gas, and, moreover, the mines are not seriously burdened with water. Although near the outcropping edge of the measures, as has been said, yet in part of the Company's holding nearly the whole of the workable coal seams in the Durham field, with their various qualities, are met with, those of most extensive prevalence being the Busty and Brockwell Seams, so well known for their high-class coking character; and from these seams the major part of the output of the Company's collieries is at present being raised.

Coke.—The number of coke ovens in operation is about 1,050, and the annual production of coke therefrom about 500,000 tons. The larger proportion of this is consumed at the Company's blast-furnaces, and the remainder is disposed of for use in the furnaces, &c., of Cumberland, Cleveland, and foreign pig iron producing centres.



ORIGINAL BLAST-FURNACES.

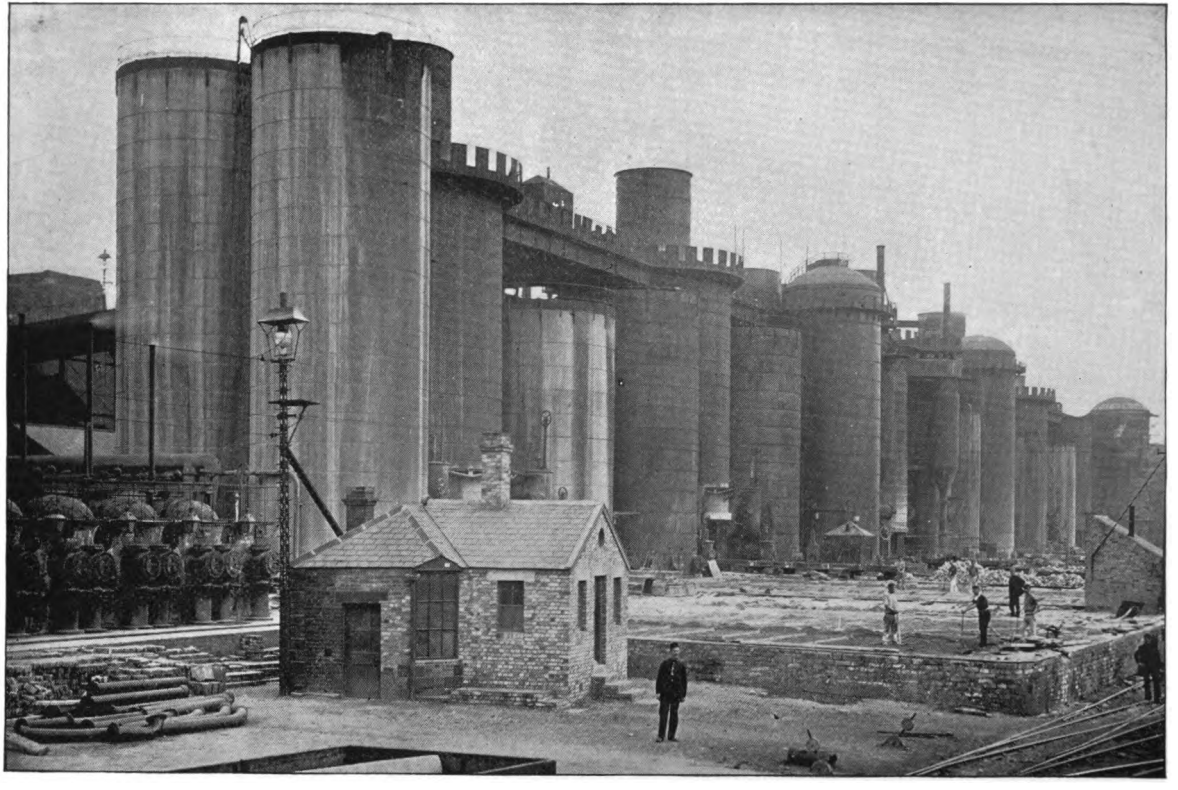
BLAST-FURNACES.

When the transfer of the old plant to the new Company took place, there were six blast-furnaces at Consett, and also one which had been pulled down, and the foundations of which were being prepared for the erection of a larger furnace. The furnaces were all open topped, as shown in the accompanying view. The blast was heated by cast iron U and pistol pipe stoves, fired by coal, and having a blast pressure of 3¼ lbs. to the square inch. There were four beam blowing engines, namely, a single blast engine, steam cylinder 2-ft. 8½-in. diameter, blast cylinder 6-ft. 0-in. diameter, with 6-ft. 0-in. stroke; a double blast engine, steam cylinders each 2-ft. 11-in. diameter, blast cylinder each 6-ft. 7-in. diameter, with 7-ft. 8-in. stroke; and a single blast and rolling mill engine, steam cylinder 3-ft. 8-in. diameter, blast cylinder 7-ft. 0-in. diameter, with 6-ft. 11-in. stroke. At Crookhall, there were three beam blowing engines—a single blast engine, steam cylinder 2-ft. 8-in. diameter, blast cylinder 6-ft 8½-in. diameter, with 8-ft. 0-in. stroke; and a double blast engine, steam cylinders each 3-ft. 2-in. diameter, blast cylinders each 8-ft. 0-in. diameter, with 8-ft. 6-in. stroke. A double blast engine was also in use at Bradley, steam cylinders each 3-ft. 1-in. diameter, blast cylinders each 7-ft. 6-in. diameter, with 7-ft. 11-in. stroke. The blast-furnaces at Crookhall and Bradley were blown out, and the blast engines at Consett

have since then been either thrown altogether out of use, or thoroughly reconstructed. At the present time there are four large beam blowing engines, made by the Lilleshall Iron Company, each with a steam cylinder 4-ft. 2-in. diameter, blast cylinders each 8-ft. 4-in. diameter, with 9-ft. 0-in stroke. There are also two beam blowing engines, made by Murray, of Chester-le-Street, and thoroughly reconstructed, steam cylinders each 2-ft. 11-in. diameter, blast cylinders each 6-ft. 7-in. diameter, with 8-ft. 0-in. stroke; besides two beam blowing engines, made by Abbot, of Gateshead, and Clarke, of Sunderland, steam cylinders each 3-ft. 1-in. diameter, blast cylinders each 7-ft. 6-in. diameter, with 7-ft. 11-in. stroke.

In 1865 one large blast-furnace, with five tuyeres, was in blast, and produced about 340 tons per week, while the smaller ones produced about 230 tons per week each. These small furnaces were not adapted to the modern requirements of the trade, and the growing demand for iron, therefore, rendered the reconstruction of the blast-furnace plant necessary. Accordingly, within the next eight years, the whole of the furnaces originally erected at Consett were pulled down and six larger ones substituted. In the year 1880, a seventh furnace, similar to the others, was added, thus completing the present range.

Blast-furnaces.—These seven blast-furnaces are each 55-ft. high, and 9-ft. diameter of hearth; height to top of boshes, 20-ft.; diameter of top of boshes, 20-ft.; diameter of throat, 14-ft. 6-in.; and bell with 10-ft. 6-in. opening. There are seven tuyeres to each furnace. All the furnaces are fed with



RANGE OF BLAST-FURNACES FROM THE NORTH.

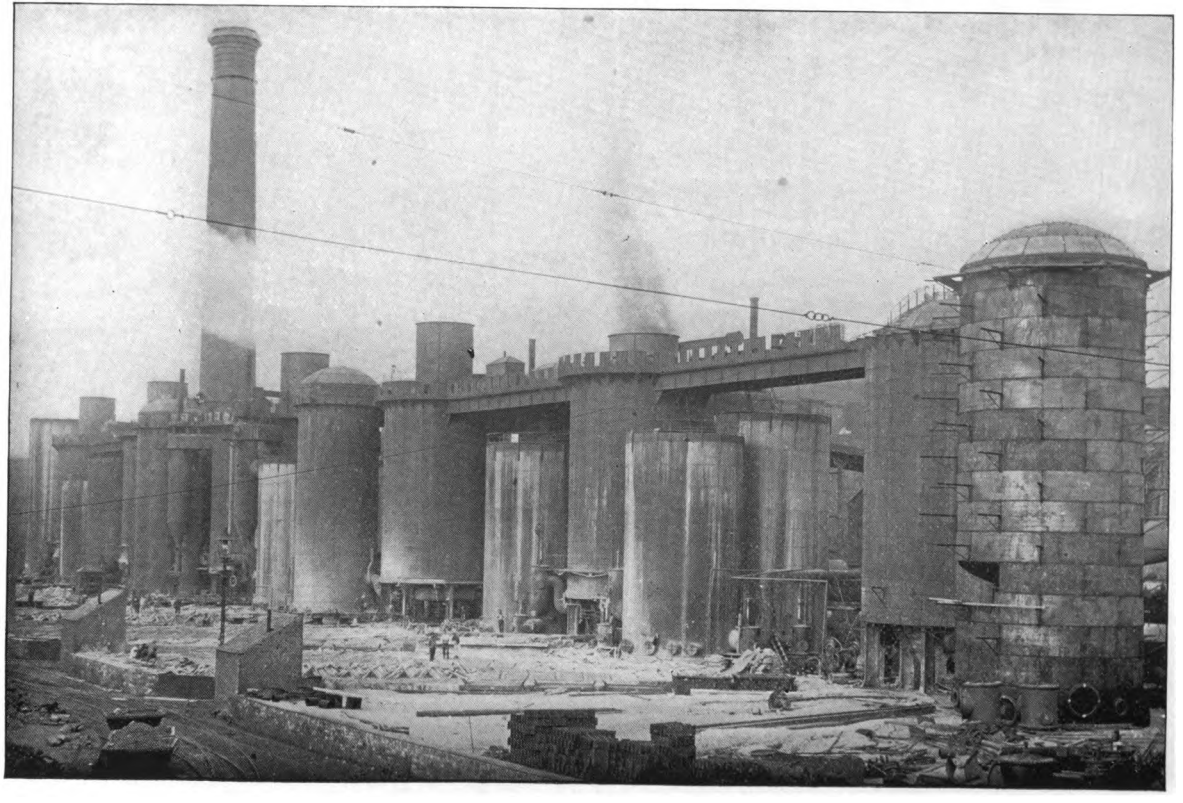
material by means of bell and hopper, with standard beam and hydraulic brake, with an escape gas tube and slide at the top 1-ft. 8-in. diameter, regulated by means of a chain and pulley worked by the stoveman at the bottom of the furnace. Each of the furnaces is provided with a dustcatcher, which delivers the dust direct into wagons or iron barrows. All the furnaces are connected by means of a gangway at the top, and the charging material is run in iron barrows to the foot of an incline 125-ft. long, and having a total rise of 15-ft., up which incline eight full barrows are hauled at a time on a large cage while a similar number of empty ones are descending to be filled. The ore and other material for the furnaces is brought in on a high-level approach, considerably above the tops of the blast-furnaces, and is there tipped into gears through bottom board trucks on to a level with the foot of the incline above mentioned, and where the barrows are filled.

Stoves.—Four of the blast-furnaces have four of Whitwell's hot blast fire-brick stoves to each furnace, all of them 22-ft. diameter. One furnace has two stoves 65-ft. high, another stove is 45-ft. high, and a fourth is 40-ft. high. A second furnace has four stoves, each of which is 46-ft. high. Another furnace has one stove 65-ft. high, two 40-ft. high, and one 35-ft. high. The other furnace has two stoves 45-ft. high, and two 40-ft. high. The other three furnaces have three Cowper stoves to each furnace. Two of them have stoves 21-ft. diameter by 65-ft. high, while the other has stoves 24-ft. diameter by 66-ft. high. The pressure of blast now maintained is $4\frac{1}{2}$-lbs. per square

inch, and its temperature on entering the furnace, ascertained by Siemens copper ball pyrometer and latest scale, is about 1300° Fah. At the present time five furnaces are in blast. The other two are being re-lined. All the five furnaces are making Bessemer pig, and produce on an average 750 tons per furnace per week, from a mixture mainly composed of Bilbao-Rubio ore, with a small admixture of other pure ores. The largest week's make of a single furnace is 919 tons of Bessemer pig iron, of which 85 per cent. was No. 1 quality, the remainder being Nos. 2 and 3. The limestone used comes from Stanhope in Weardale, and the coke from the Consett Company's own collieries. Since the substitution, to a very large extent, of the manufacture of steel plates instead of those of iron, the use of ironstone from the Cleveland district has been discontinued.

Originally the Company obtained their supply of hematite ore from Cumberland and Lancashire, but in the year 1872 they amalgamated with the Dowlais Iron Company, Herr Krupp of Essen, and Messrs. Ybarra of Spain, in the formation of the Orconera Iron Ore Company, Limited. This Company having acquired large hematite mines at Bilbao in Spain, they proceeded to develop them by the construction of railways, shipping staithes, &c., at a cost of £500,000, and for a considerable number of years the Consett Company have received, and still receive, therefrom large supplies of hematite ore of excellent quality.

Boilers.—The steam required for driving the blast engines is raised by thirteen double egg-ended boilers, each consisting



RANGE OF BLAST-FURNACES FROM THE SOUTH.

of two lengths 35-ft. long by 4-ft. 6-in. diameter, six long egg-ended boilers each 70-ft. long by 4-ft. 6-in. diameter, and twelve double tubular boilers, each 31-ft. 4-in. long, six of which are 7-ft. diameter, and the remainder 7-ft. 6-in. diameter. The waste gas is taken from the top of the furnaces through the dustcatcher and downcomer (at the foot of which a wing valve is provided for the purpose of disconnecting any particular furnace while it is off blast or during a temporary stoppage) into a large underground brick flue 10-ft. high by 6-ft. wide, from which it is distributed for the purpose of heating the stoves and boilers, the waste gases from which pass through a larger sized underground brick flue to a large fire-brick chimney, 250-ft. high from the surface of the ground, and 16-ft. 6-in. diameter inside at the top. The erection of this chimney, which is a landmark for the surrounding country, was begun on the 28th of May, 1868, and without a single day's stoppage was finally completed on the 3rd of October in the same year. The principal quantity of water used at the Consett blast-furnaces and boilers is obtained from the Consett Waterworks Company, and after passing through the tuyeres is pumped up again by large 1-ft. diameter double-ram pumps from a low level hot water pond to a high level cooling reservoir, from which it flows in pipes to the tuyeres and to the casting beds for the purpose of cooling the pigs, the pressure being about 20 lbs. to the square inch.

The slag from the furnaces is run into conical circular moulds, placed on iron bogies, which when full are hauled by means of locomotives (similar to those which haul away

the bogies of pig iron) in trains to the tip end, which is about 100-ft. high, and upwards of half-a-mile from the furnaces. The balls of slag, each weighing from three to four tons, are then stripped of their conical covers, and tipped over the end of the heap.

Electric Machinery.—In each of the two blast engine houses there is placed a large horizontal double cylinder steam engine, each steam cylinder having a diameter of 1-ft. 5½-in. by 2-ft. 4-in. stroke, with a fly wheel 10-ft. diameter, over which a belt runs on to a sheave 3-ft. 2-in. diameter. The axle on which this sheave is fixed has also five other wrought iron sheaves, each 4-ft. 6-in. diameter, keyed on to it, each of which drives, by means of a hair belt running over a small sheave 1-ft. 2-in. diameter, a Brush dynamo, capable of driving twenty-five double carbon electric arc lamps, each 2,000 nominal candle power, which lights are distributed over the various departments of the Works. Another dynamo is being fixed for the purpose of driving, by means of electric motors, three pumps in the Blackhill Colliery Drift, and which are capable of pumping from 158 to 240 gallons of water per minute.

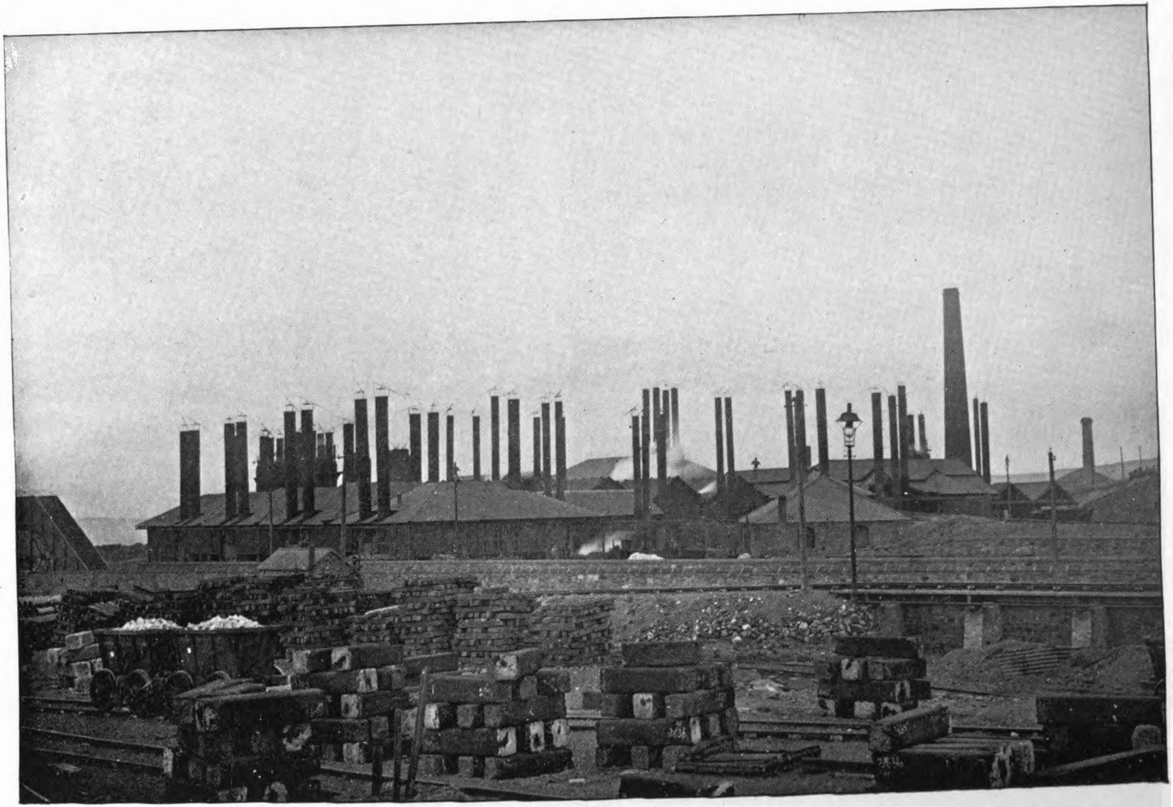
MALLEABLE IRON.

WHILE this increased produce of pig iron was being provided for, the Company went on increasing the consumption of pig iron in their own forges. Prior to 1869-70, the manufacture of other kinds of malleable iron than rails and plates had been discontinued, and attention solely given to the production of these two articles. At this time the output of rails, and plates for shipbuilding and other purposes, amounted to about 900 tons weekly, but during the continuance of the demand for iron rails the output of the latter was increased for America and our Colonies, and up to about 1876 the total output of plates and rails was doubled, in some weeks nearly 2,000 tons being made. To attain this, increased power was obtained, and great changes were made in extensions in the malleable iron departments. About 1876 came the extinction of the iron rail trade, and the substitution of steel rails. This at once crippled the malleable iron trade in the North of England, and reduced the output from about 600,000 tons to 300,000 tons per annum, the output at Consett being reduced fully one-third. Having, however, lost their rail trade, the Company kept abreast of the times by meeting the enormous and unparalleled demand for iron ships. During the serious depression between the years 1876-79, they directed their entire power on iron plates. The forges and mills were strengthened, the rail mill demolished, and converted for

plate making, till in 1882 the Works turned out frequently 1,900 tons of iron ship plates weekly. To produce this large quantity, there were 170 puddling furnaces, with ten steam hammers and suitable rolling power, and seven plate rolling mills.

At the present time, the production of malleable iron is confined to the Tin Mill, the other puddling mills being dismantled, except the driving engine and trains of No. 1 mill, with fourteen puddling furnaces, boilers, and hammers, which are still existing, but not now in use.

The Tin Mill.—The works here, as already stated, were originally designed for the manufacture of tin plates, but they were converted into rolling mills after their acquisition by the present Company. Now they consist of one puddling and two plate mills. The puddling train is 22 inches, having three stands of rolls, which are driven by a fly wheel engine. There are forty-six puddling furnaces and two cinder furnaces, two 3-ton steam hammers, and two hot-bar shears, with the necessary bar banks, loading gullets, &c. The plate mills are driven by a pair of high pressure direct acting non-condensing fly wheel engines, geared as 1 is to 1, and coupled at right angles. They are 25-in. and 22-in. mills, coupled to each end of the counter shaft, and each having one stand of pinions, one stand of roughing, and one stand of finishing rolls. The 22-in. mill has one stand of chequering rolls in addition. Between the two mills are fourteen cold and wash heating furnaces, mostly working through boilers. Each mill is amply provided with floor space, shearing machines, and



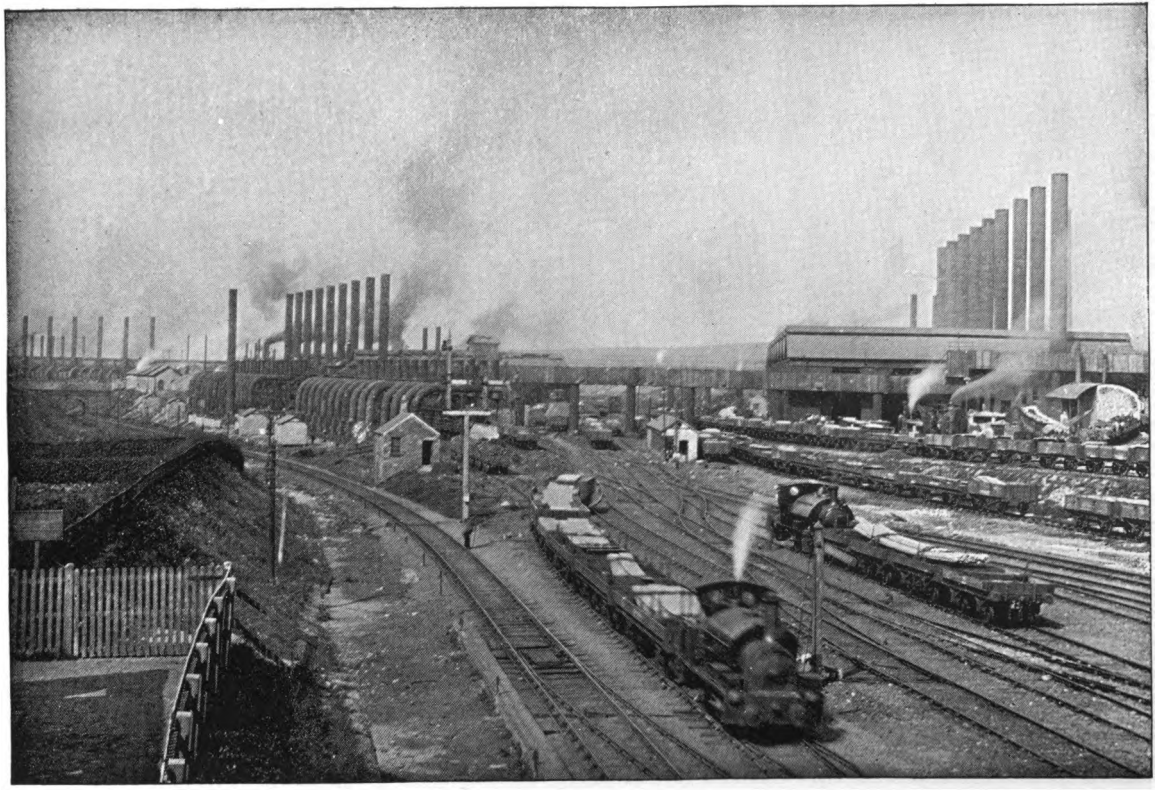
TIN MILL.

plate turning-over gear. There are thirty mill furnace boilers, of the egg-ended Lancashire and vertical type, and two egg-ended hand-fired boilers are also available when needed. The fitting, smiths', and joiners' shops are in close proximity. The make of plates of all descriptions is about 500 tons per week.

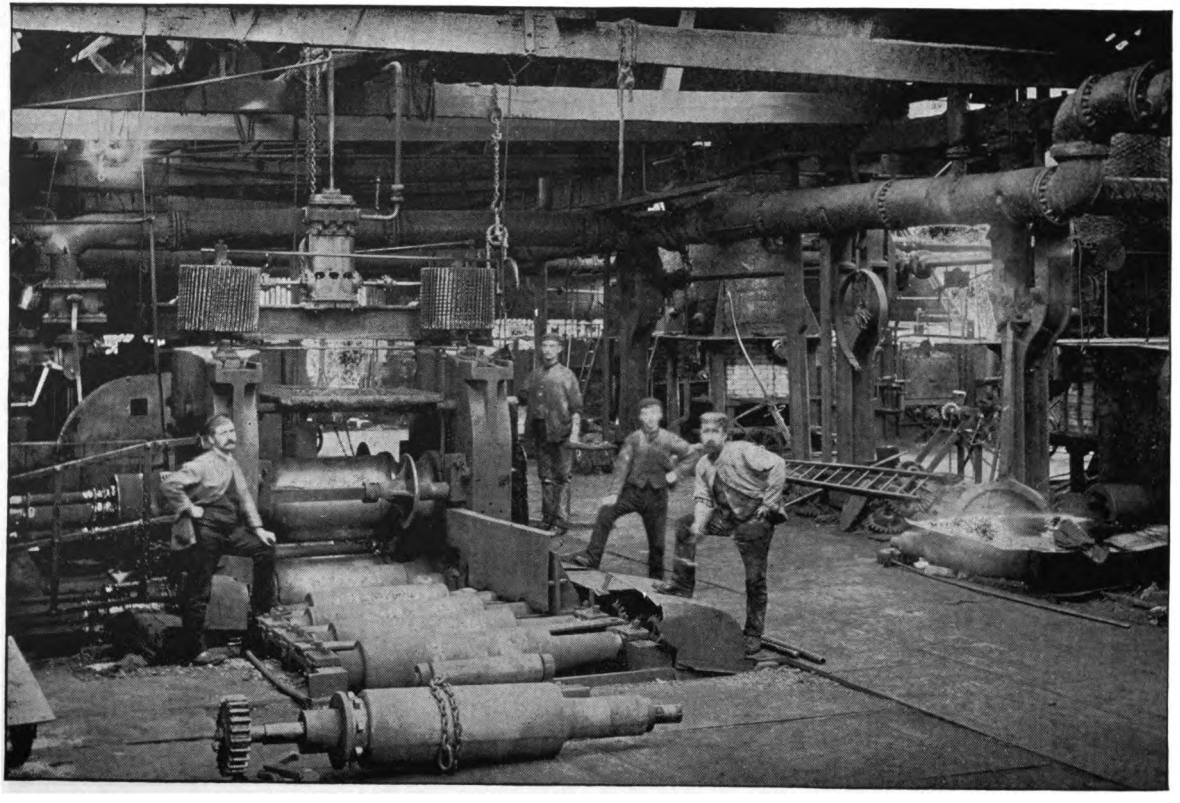
STEEL MANUFACTURE.

STEEL PLATES.

Melting Shops.—In the year 1882, it becoming apparent that the use of steel plates for shipbuilding purposes made by the Siemens-Martin process was rapidly making headway, the Company began the erection of two small 13-ton Siemens furnaces, together with an 8-ton steam hammer and Siemens furnace for heating the ingots. This plant was got into operation the following year, and the manufacture of steel plates from hammered ingots was commenced. These furnaces were very rapidly followed by four other 17-ton furnaces, and shortly afterwards by two more of the same size, all the eight furnaces being in one row. Meanwhile the use of the hammer had been discontinued for cogging; and the Siemens gas heating furnace, used for heating ingots for the hammer, has since been converted into a 20-ton melting furnace, in line with the eight already referred to. These nine furnaces now constitute what is designated the West Melting Shop. As they have required reconstruction, they have been enlarged to a capacity of 20 tons, and at the present time seven are of that size, while the other two are of 17 tons. The casting pit is parallel with the line of the furnaces, and the ladles are run along over the moulds by being attached, with moveable bars, to the locomotive cranes. Each furnace has a



WEST AND EAST MELTING SHOPS.



NO. 2 COGGING MILL.

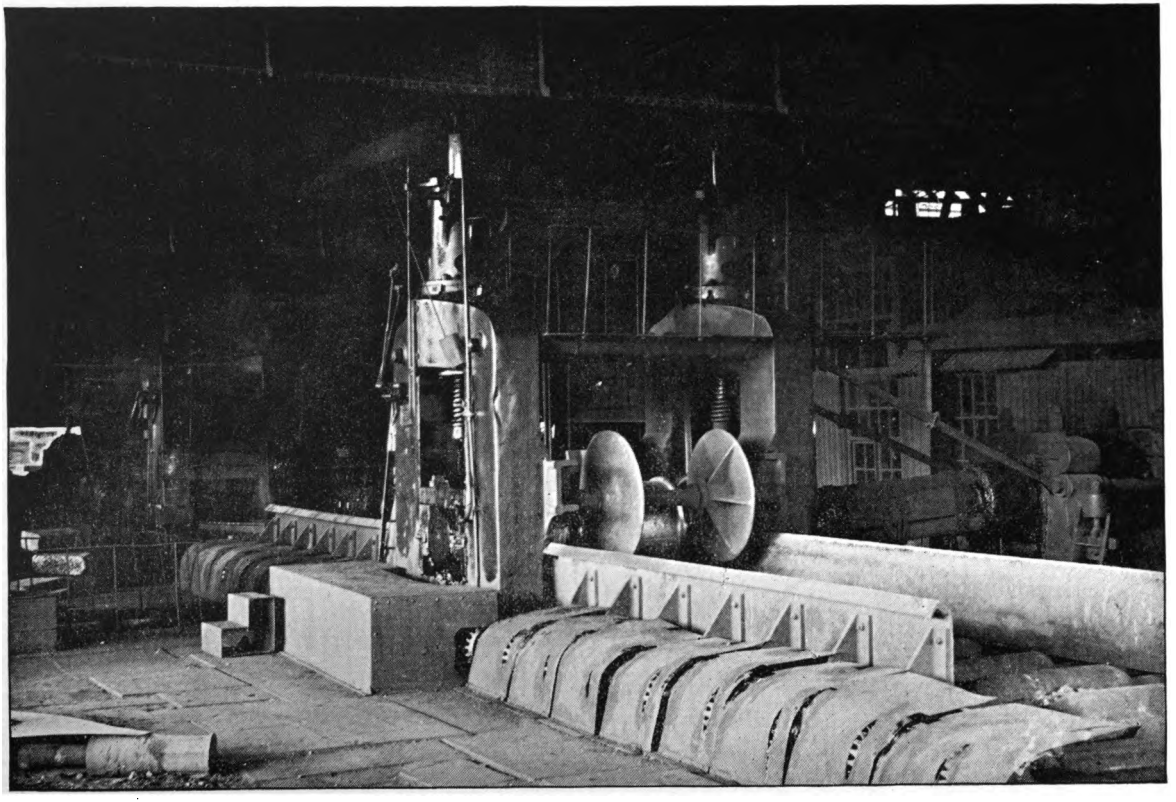
separate ladle and carriage, and the ladle is dried by means of gas from the producers, and is always in readiness so soon as the charge is melted. In the year 1887, the erection of another plant of nine 25-ton melting furnaces was completed, and the furnaces got into operation. These constitute the range known as the East Melting Shop, the general arrangements being similar to those already described. The gas of the East and West Melting Shops is supplied from a range of thirty-three blocks of ordinary Siemens gas producers blown with steam, the gas being conveyed in overhead tubes to the two shops. These two shops were designed by and erected under the supervision of the late Mr. John P. Roe, C.E. All these melting furnaces at present are worked with one gas and two air ports, and have arched roofs. The bricks used for the body of the furnace are principally Sheffield ganister, whilst those for the chequer work in the regenerative chambers are made by the Consett Company, from a local ganister. The two furnaces first erected have butterfly reversing valves; and the others are fitted with double beat disc valves. The ingot producing capacity of these two shops is about 3,500 tons per week.

No. 2 Cogging Mill.—A 28-in. Cogging Mill is driven from the No. 2 Plate Mill Engine, through bevelled gearing, and is reversed by steam clutch. The mill was originally designed for blooming for iron plate making, and was so used for three or four years. When steel came to the front, however, it was found necessary, owing to the limited hammer accommodation at the steel

works, to begin the cogging of ingots, and consequently this No. 2 Cogging Mill was altered to meet the demand. There not being room to place a bloom shear, a hammer was fixed, with serving tables, worked by steam rams and small engines, for the purpose of cutting the cogged slabs into lengths. This mill is capable of dealing with about 1,400 tons of ingots per week.

No. 1 Plate Mill.—This has one stand of pinions, one stand of roughing, and one stand of finishing rolls, each 6-ft. 3-in. by 25-in., driven by a high pressure direct acting non-condensing fly wheel engine, the fly wheel weighing 70 tons. A steam lift is provided, whereby slabs weighing from 20 to 25 cwt. may be dealt with. The capacity of the mill for production of plates is equal to 370 to 380 tons per week.

No. 2 Plate Mill is a clutch reverse mill, and contains one stand of pinions, one stand of roughing, and one stand of finishing rolls, each 7-ft. by 25-in. It was originally put down for iron plate rolling. The balance gear for the roughing rolls is carried overhead to save excavation. The mill is driven by a high pressure direct-acting non-condensing fly wheel engine; and the reverse action is obtained by the five-wheel method and clutch motion. All the wheels, shafts, and clutches are made of Siemens steel. Ample floor space is provided for both of the above mills, and they are covered with a substantial iron roof. Each has conveniently placed for its use large plate and scrap shearing machines. The plate shear for No. 2 Mill was made by Francis Berry, of Sowerby Bridge; while the plate and scrap shearing



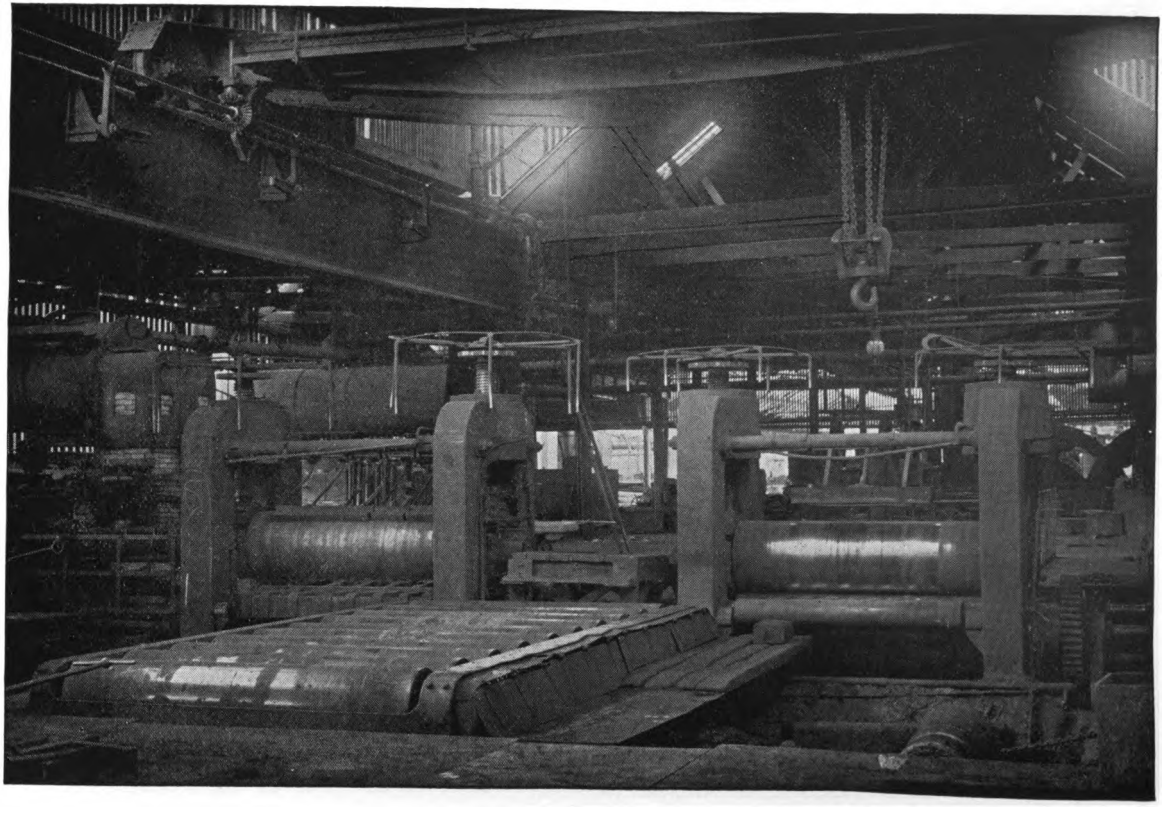
NO. 4 COGGING MILL.

machines were made by Joshua Buckton & Co., of the Wellhouse Foundry, Leeds. There are ten egg-ended hand-fired boilers, one Lancashire hand-fired boiler, two Lancashire furnace boilers, and six steam furnace stack boilers. Necessary heating furnaces are also provided for both mills. The output of this mill is about 660 tons of plates per week.

No. 4 Cogging Mill is a 45-in. mill, having one stand of pinions and one stand of cogging rolls, driven by a pair of coupled high-pressure non-condensing direct-acting engines, geared as 2½ to 1, the wheels, shafts, and couplings all being of Siemens mild steel. The mill is provided with live roller gear on each side, and hydraulic edging gear on the delivery side, for manipulating the steel blooms during cogging operations. The top roll is balanced by hydraulic power, and screwing is done by steam power. In a line with the mill, and some fifty or sixty feet apart, is placed a large bloom shearing machine, driven by high-pressure reversing engines, and provided with the necessary live rollers, mounted in falling tables to the receiving and delivery sides of the shear. The engines were made by Hawks, Crawshay, & Sons, of Gateshead, and the mill by Miller and Company, of Coatbridge, while Buckton and Company, of Leeds, made the bloom shear. This cogging plant was erected in the year 1887, to deal with the ingots produced at the East Melting Shop; and at the same time Nos. 3 and 4 Plate Mills were remodelled and strengthened. In the cogging square are seven heating furnaces served by a Dûbs steam crane. This plant is capable of cogging 2,000 tons of steel ingots per week.

No. 3 *Plate Mill* has one stand of pinions, one stand of roughing, one stand of finishing, and one stand of chequering rolls, the roughing and finishing rolls being each 6-ft. 3-in. by 25-in., and the chequering rolls 5-ft. 6-in., by 25-in., and all being driven by a high-pressure direct-acting non-condensing fly wheel engine, geared inversely as 1½ to 1. The steam lift in this mill is similar to that in No. 1. The floor space is ample, and the large plate and scrap shearing machines which stand on it were made by Buckton, of Leeds. Heating furnaces are provided, the whole being covered by a lofty and substantial roof. The mill produces about 360 tons of plates per week.

No. 4 *Plate Mill.*—This is a 28-in. clutch reverse mill, and is also driven by a high pressure direct-acting non-condensing fly wheel engine, the reverse action being obtained by the five-wheel method and clutch motion, and all gearing and shafts being made of Siemens mild steel. The mill has one stand of pinions, one stand of roughing, and one stand of finishing rolls, these latter being 8-ft. by 28-in. On the delivery side of the mill is provided a traversing steam platform, constructed so as to work the plates to and fro through the rolls, and also to take them bodily from the roughing to the finishing rolls. On the receiving side is fixed a live roller frame, opposite the stand of finishing rolls only. Overhead is a 15-ton steam travelling crane, running upon strong steel-built box girders, which is used for roll changing. The heating power is ample, and there is plenty of floor space. The two large plate shearing machines here were made by Francis Berry, of Sowerby



NO. 4 PLATE MILL.

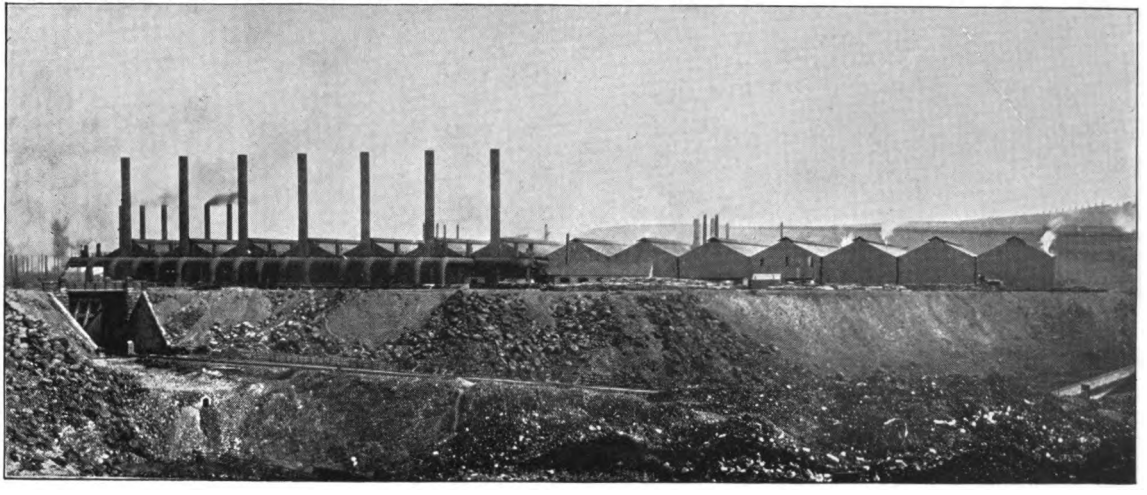
Bridge, and Buckton & Co., of Leeds. The output of the mill is 1,100 tons of steel plates per week.

A battery of sixteen hand-fired Lancashire boilers is placed outside the No. 4 Cogging Mill for raising steam for the mills, all made by Adamson & Co., of Dukinfield, near Manchester; and altogether there are in the Cogging Mill, and in Nos. 3 and 4 Plate Mills, thirty boilers, six of these being furnace stack boilers, eight are Lancashire furnace boilers, and the rest are Lancashire hand-fired boilers.

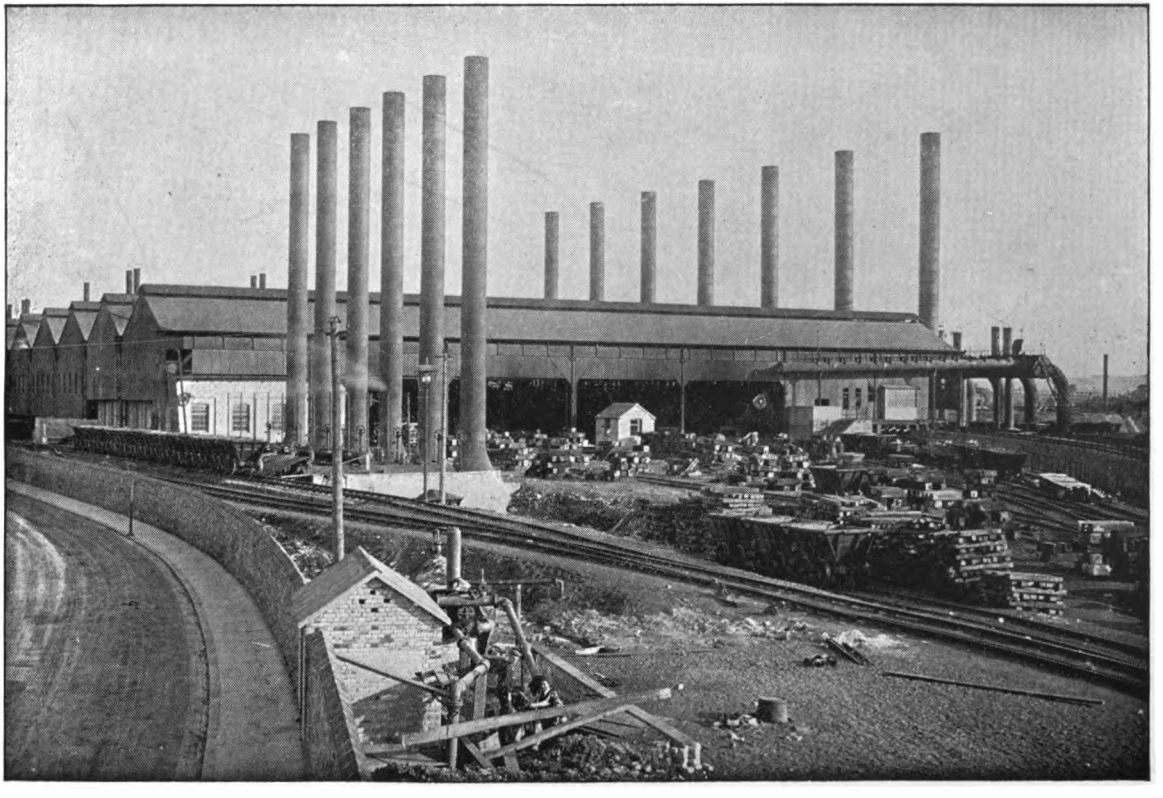
STEEL ANGLES, &c.

General Description.—Five years ago, the Company decided to meet the requirements of shipbuilders by supplying them with angles and other sectional steel, in addition to plates, and accordingly looked about for a suitable site for the erection of the necessary plant. The ground to the north of the General Offices was rugged and uneven, and of a very unpromising character for the erection of works thereon. Heaps of slag and other refuse had been deposited here and there, from time to time, and in some places there was an inequality of upwards of thirty feet. However, no other site being so conveniently situated, it was finally adopted, and the task of excavating and building commenced. In some places the slag had to be quarried to a depth of thirty-five feet, massive retaining walls were built where needful, and hundreds of thousands of cubic yards of non-combustible material had to be filled in to bring the floors up to a proper level.

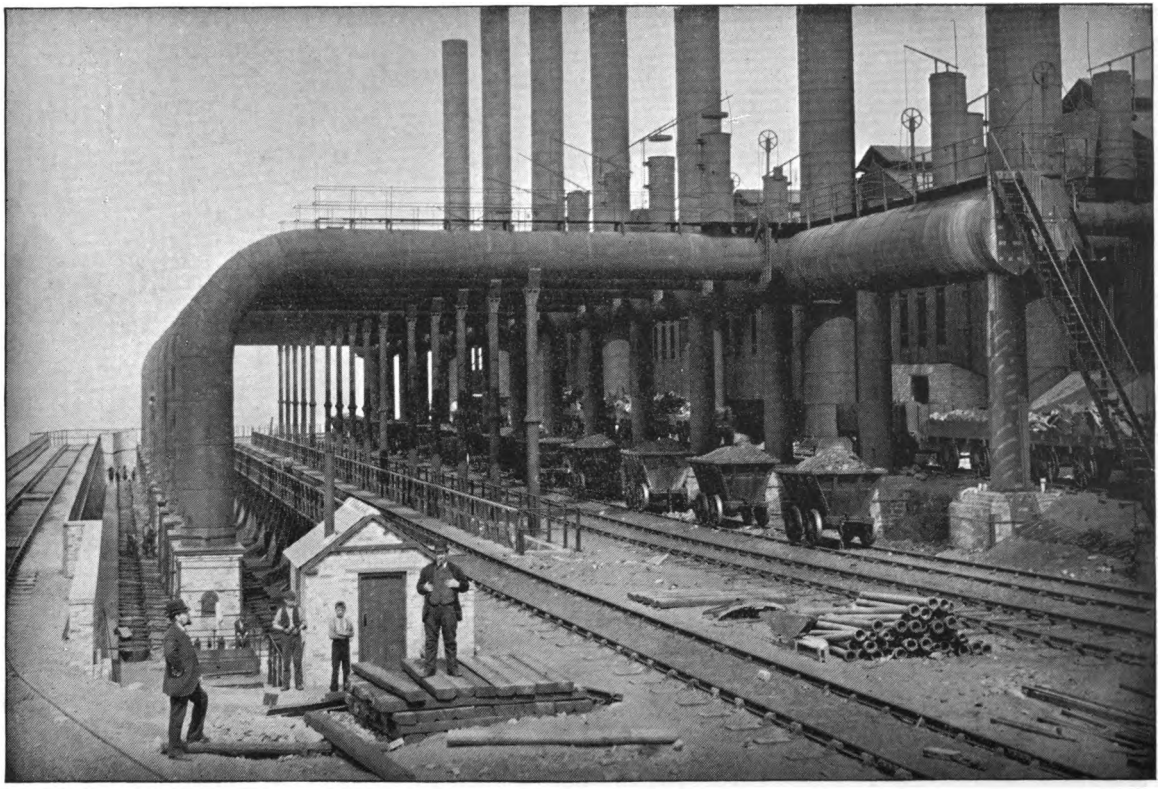
The new Angle Mills occupy an area of about 16 acres, and consist of fifteen blocks of gas producers, seven melting furnaces, a 45-in. cogging mill and bloom cutting shear, and three mills for the production of angles, tees, bulbs, channel and girder sections, round and square bars, &c. Two of the angle mills are 32-in. and 22-in. respectively, and the third is a 12-in. angle and guide mill, all with their necessary



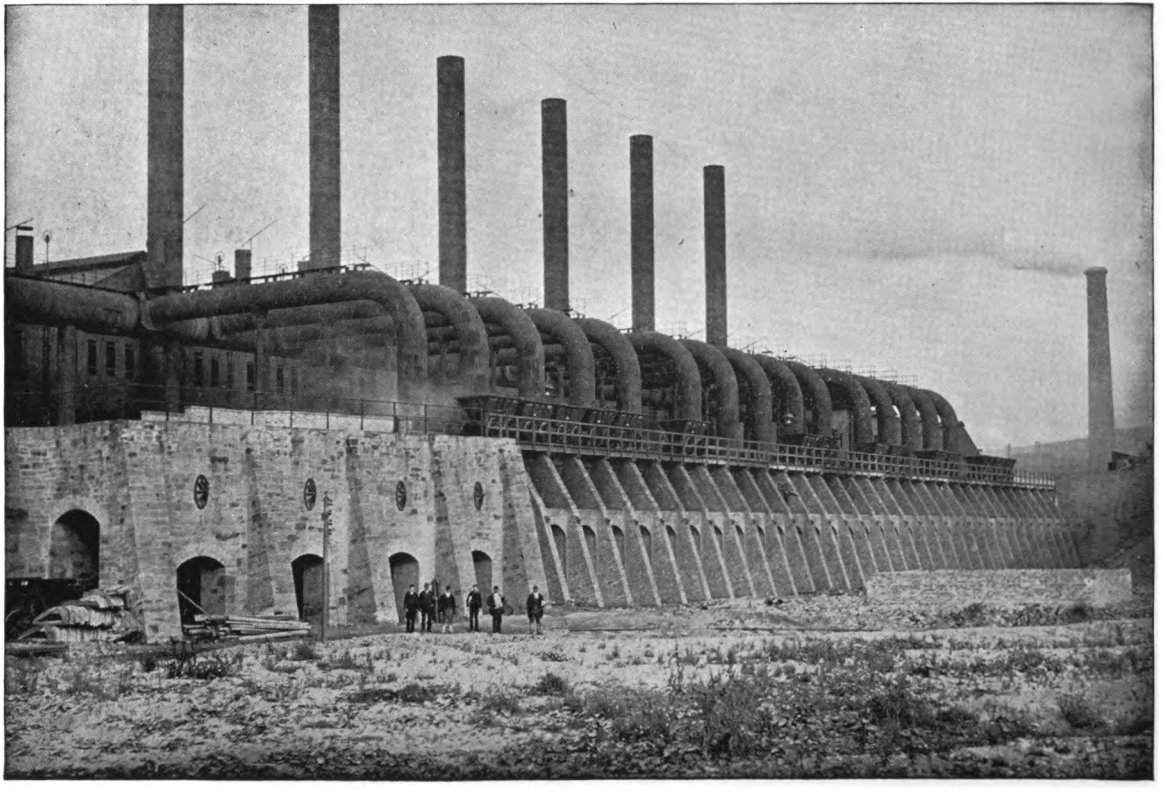
GENERAL VIEW OF ANGLE MILLS.



ANGLE MILLS FROM THE NORTH.



GAS PRODUCERS.—NORTH SHOP.



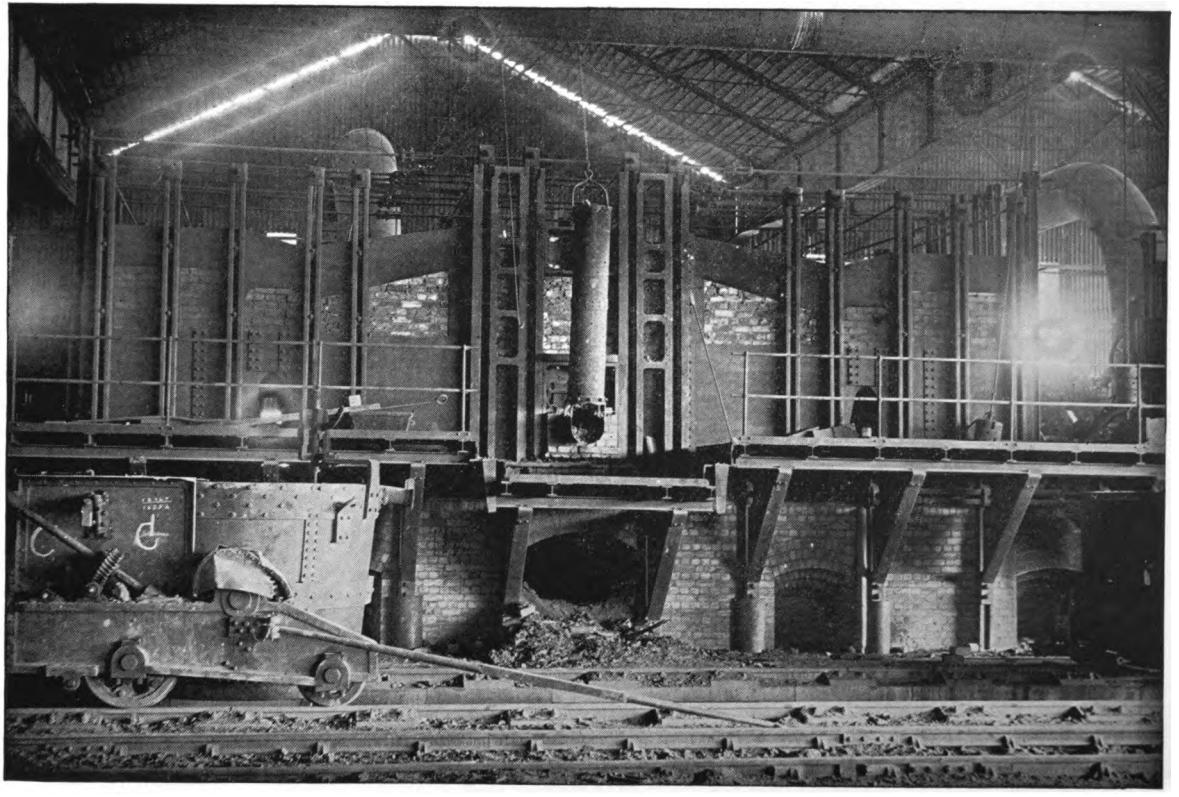
GAS PRODUCERS.—NORTH SHOP.

engines, together with live roller gear, billet skids, heating furnaces with boilers attached, hydraulic plant, fitting and smiths' shops, roll turners' shop, overhead cranes, hot sawing machines, billet and scrap cutting shears, bar banks fitted with bar skids, loading gullet, and the other needful accessories, the plant being designed for a production of 1,500 tons of angles, bars, &c., per week. The melting shop and mills are protected by a lofty iron roof of fourteen bays, each 50-ft. span, and cover about four acres of ground.

Gas Producers.—These are of the Siemens type, and are provided with two lines of coal bunkers at the top, one on each side, and the whole having railway connections, so that the coal may be brought in from the north or south without shunting. The ashes are filled from the fire-hole level into chaldron wagons, and hauled by locomotive power through deep gullets designed for this purpose. Along the top of the producers, and within easy reach of the bunkers, are the hoppers, the coal being fed by hand labour. The gas is taken off at the top of the producers, and passes through tubing to a longitudinal receiver. The whole of the tubing for the gas uptakes, and also that for conveying gas to the furnaces, is above ground, and is supported by strong columns. All the tubes are of large diameter, and are made from Siemens mild steel plates, lined out with brick.

Melting Furnaces. — Seven Siemens-Martin melting furnaces are parallel with the gas producers, and so separated from them that ample room is left for railway communication between the Consett Works on the south, and the Tin Mill on the north. Each furnace is of 25

tons capacity, and strongly cased in cast and wrought iron, the whole being bound together by strong tie bolts and rails. The charging platform is formed of cast iron plates, laid on rolled joists and built girders, all firmly bolted together, and making one continuous floor. A chimney is provided for each furnace, and all the chimneys are kept outside the roof, so as not to occupy platform space. The railway for supplying the pigs runs parallel with the outer edge of the platform, at a lower level, and is under the general mill roof, and in easy communication with the blast-furnaces. The valve chamber is of large dimensions, giving ample room for walking round the valves, and leaving sufficient space for a railway, which runs the full length of the chamber, and is used for taking in and out the necessary material. The regenerative chambers, also, are of large capacity, and they are firmly held together by rolled joists and wrought iron tie bolts. All the gas and air valves are formed with large areas, the cases being made from Siemens mild steel plates and lined with bricks. The casting pit runs parallel with and extends from end to end of the furnaces. All these latter have their own casting carriages and ladles, and there are extra ladles for re-lining purposes. The casting pit is served by two locomotive cranes, as in the East and West shops. On being taken from the casting pit, the ingots are placed vertically upon specially designed bogies, in which they are taken to the cogging soaking furnaces without being allowed to touch the ground. Sand and manganese depôts are provided at the south end of the melting furnaces, and in close proximity is a gas furnace for



MELTING FURNACE.—NORTH SHOP.

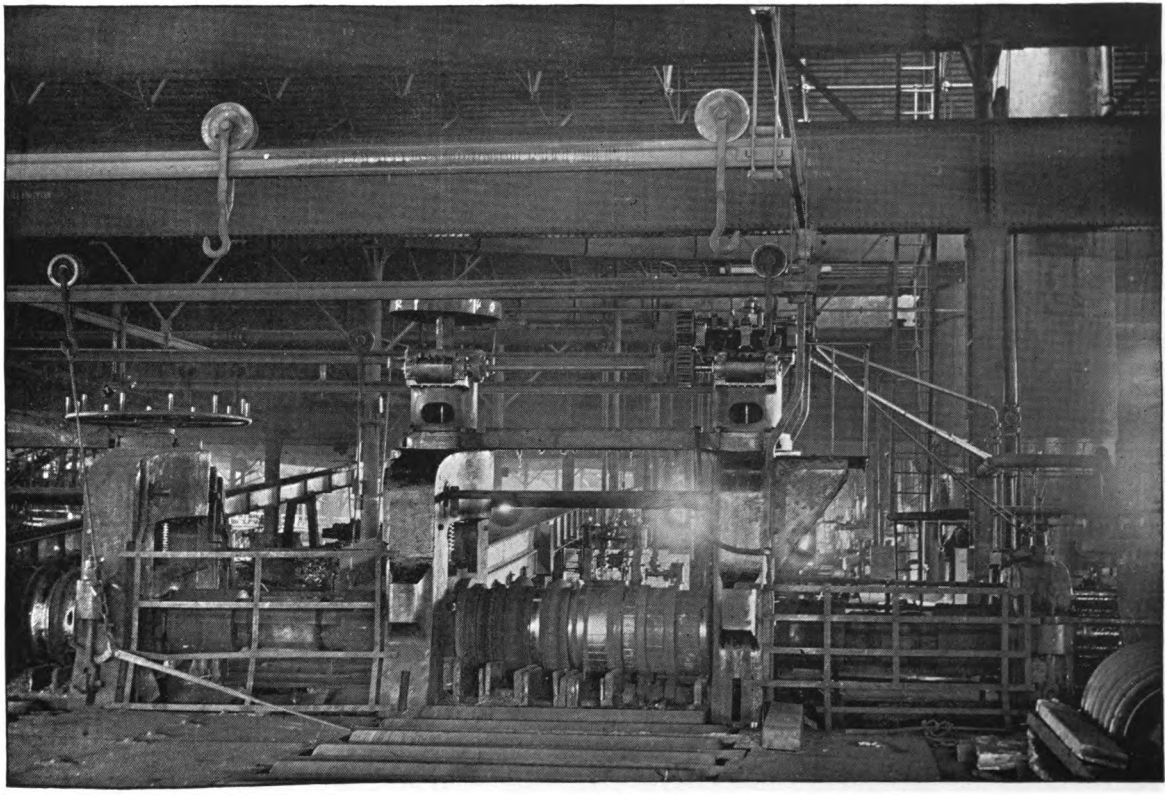
COGGING MILL AND BLOOM SHEAR.

heating them. The seven melting furnaces are covered by seven bays of pitched roofing, each 50-ft. span, and carried on cast iron columns. The roof columns are so arranged that the pit cranes can haul or swing uninterruptedly. The whole of the roofing of the melting furnaces and mills is formed of fourteen bays of 50-ft. span each, made from wrought iron and steel, and slated, the whole being made and erected by the Teesside Iron and Engine Works Co., Middlesbrough. The ingot producing capacity of this range of melting furnaces is upwards of 1,500 tons per week.

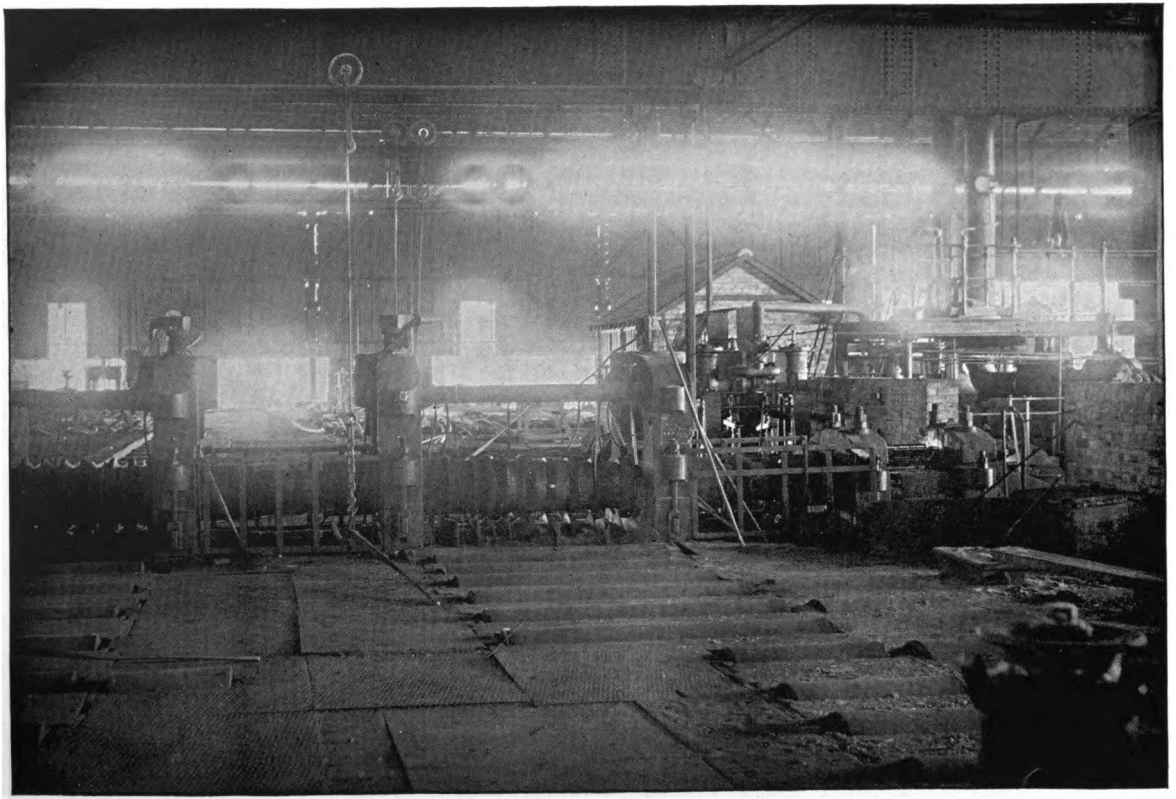
45-*Inch Cogging Mill.*—This is driven by a pair of geared high-pressure non-condensing engines, cylinders 45-in. diameter by 5-ft. stroke, geared as 2 is to 1, fitted with piston valves and Allan's link motion, and comprises one stand of roll housings, and one stand of pinions, seated upon strong cast-iron bed-plates. The pinions and coupling boxes are all of Siemens cast steel. The mill is fitted with steam screwing gear, hydraulic balance gear for top roll and breast rollers, and hydraulic tilting gear for edging or traversing the blooms into any position. The cogging mill, with live roller gear on each side, is designed for dealing with slabs or billets, and is so placed opposite the melting furnaces that the ingots can readily be taken from thence to the cogging heating furnaces, without appreciable loss of initial heat. These furnaces are five in number, of the horizontal type, coal fired, and each arranged to work through a vertical boiler. Hydraulic charging and with-drawing machines are designed in such a way that ingots up to five tons in weight can

readily be dealt with. Space is left close to the cogging mill for vertical coal heated furnaces, if it should be decided to adopt them. The cogging mill and engines were made and erected by Lamberton and Company, of Coatbridge. Directly in front of the cogging mill, and about 75-ft. distant, is a large billet shear, made to cut slabs or billets, (capable of cutting blooms 30-in. by 12-in.), fitted with a pair of powerful reversing engines, with cylinders 26-in. diameter by 2-ft. 6-in. stroke, geared through steel gearing as 20 is to 1. A range of live roller gear is placed on either side of the shear, a portion on the receiving side being balanced by hydraulic power, and that on the delivery side supported on spiral springs, the receiving and delivery frames being driven by separate engines. The shear was made and erected by Buckton and Company, of Leeds.

The 32-Inch Angle Mill is driven by a pair of reversing high-pressure non-condensing engines, with cylinders 54-in. diameter by 4-ft. 6-in. stroke, coupled direct to the mill by an inside crank shaft and steel couplings fitted with piston valves and Allan's link motion. The mill, which is about 125-ft. distant from the bloom shear, has one stand of pinions, one stand of roughing, and one stand of finishing rolls, all coupled through steel boxes and spindles, while provision is made for an additional third stand of rolls for meeting the rolled joist and girder trade. The top roughing roll is fitted with steam screwing gear above, and hydraulic balance gear below. On the receiving and delivery sides of the mill, live roller gear is provided, driven by vertical reversing high-pressure engines; and there are also inclined shoots, mounted



32-INCH ANGLE MILL.



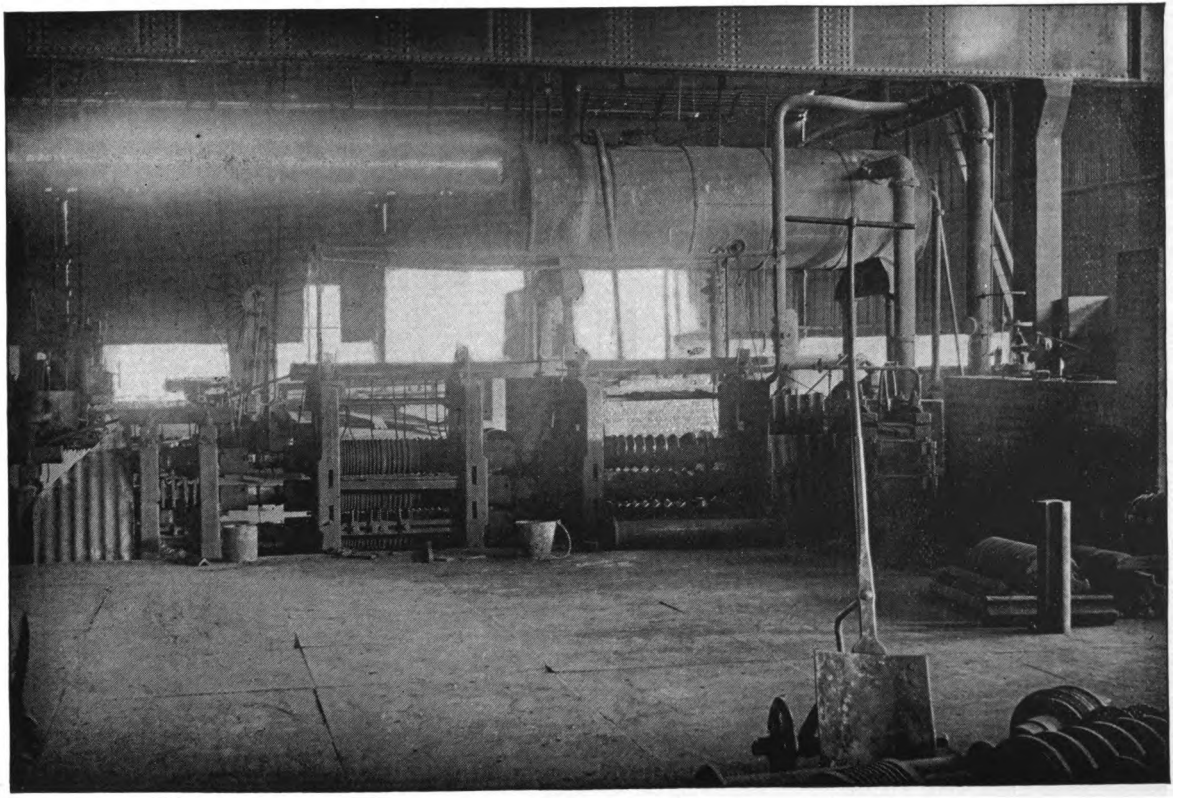
22-INCH ANGLE MILL.

upon strong wrought steel columns, along which the bars are driven while being rolled, clear of all mill floor operations. On the receiving side is also fitted a bar skid for taking over the blooms from the roughing to the finishing rolls. Live rollers are placed on the finishing side leading to the billet shear, with two steam circular sawing machines, properly spaced for dealing with bars up to 280-ft. in length or more. Parallel with this is a system of relief live rollers for the purpose of distributing the bars to the best advantage over the bar bank. The mill is designed for rolling off purposes, and with this end in view, it is placed directly in a line with the bloom shear and cogging mill. Two horizontal, re-heating, coal-fired furnaces are provided to meet emergencies, each fitted with a vertical boiler and hydraulic charging and with-drawing machinery. Near the two heating furnaces, and between the bloom shear and 32-in. mill, are placed a hydraulic billet lift and delivery frame. In this way billets are lifted very expeditiously and placed upon the charging bogie, without the use of a crane, and with very little loss of time. The space behind the mill is laid out for the erection of punching, straightening, drilling and cold sawing machines, &c. The driving engines, mill, live roller, and skid gear, were all manufactured and erected by Miller & Co., of Coatbridge.

22-Inch Angle Mill.—This is also driven by a pair of reversing high-pressure non-condensing engines, with cylinders 40-in. diameter by 4-ft. stroke, coupled through steel boxes and spindles in the same manner as the 32-in. mill. It comprises one stand of pinions, one stand of roughing,

and one stand of finishing rolls, with live roller gear on the receiving and delivery side, and an inclined shoot on the receiving side only. The live roller gear leads from the mill to the billet shear and steam circular sawing machine, and on a line with these is a relief live roller frame for distributing the rolled bars, as in the 32-in. mill. The mill is designed either as a rolling-off or re-heating mill, and for this purpose there are conveniently placed four horizontal coal-fired furnaces with vertical boilers, and hydraulic charging and with-drawing gear attached. The two re-heating furnaces for the 32-in. mill may also be worked in connection with this mill when necessary. The billets are taken from the end of the bloom shear delivery table, direct to the re-heating furnaces by means of a rope skid, and are lifted on to charging bogies by means of a 3-ton steam locomotive crane, which may be likewise used for stocking billets. In rolling off, the billets are taken direct from the bloom shear by means of the rope skid, and delivered automatically on to the live roller frame, along which they are taken straight to the roughing rolls without manual labour. Lamberton & Company made and erected the engines and mill, while the billet skid and engines were constructed by the Grange Iron Company, Durham.

12-*Inch Guide Mill.*—This is driven by a high-pressure non-condensing fly wheel engine, with cylinder 30-in. diameter by 2-ft. 6-in. stroke, fitted with piston valve and governor gear, and consists of one stand of pinions, one stand of roughing, one stand of finishing, and two stands of guide rolls, all coupled through steel boxes and spindles.



12-INCH ANGLE AND GUIDE MILL.

A steam circular sawing machine and billet shear are likewise provided. This is a re-heating mill, and two furnaces are conveniently placed, with stack boilers attached. The 12-in. and 22-in. mill furnaces are so near that they may be used to either mill as required. The exhaust steam from the engine goes into a hot water tank, which is erected quite close to it for boiler feeding purposes. Miller & Company, of Coatbridge, made the engine; the mill was erected by Taylor & Farley, of West Bromwich; while Evans & Sons, of Wolverhampton, made the boiler pumps.

Overhead Cranes.—The cogging mill is served by a 25-ton overhead square shaft steam crane; and a second overhead crane, of 15-tons capacity, with boiler attached, traverses the three angle mills and roll turning shop, these being all in one line. The cranes were made and erected by Booth Brothers, of Rodley, and are carried upon wrought steel built girders, of the box type, made and erected by Shewell & Company, of Darlington.

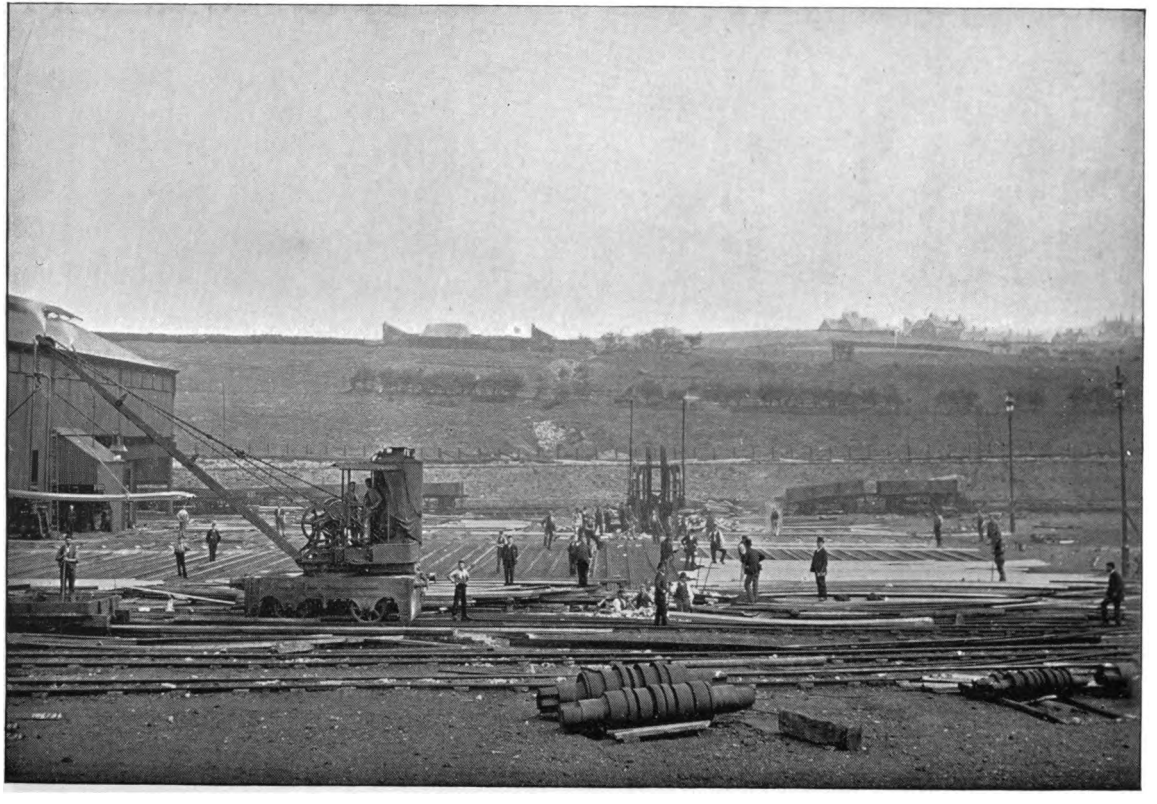
Roll Shop.—This is placed at the end of the 32-in. mill, and contains three powerful lathes, each driven by its own engine. Rolls may be sent from lathe to mill or stock, or from mill and stock to lathe, as the case may be, without any trouble. The lathes were made by Perry & Sons, of Bilston.

Hydraulic Plant.—Two sets of Worthington high-pressure pumps, one accumulator and tank, with automatic governor gear attached, are provided, all being placed compactly upon massive foundations, and working to a pressure of 700

pounds to the square inch. One set of pumps is sufficient for working the plant, but the second set is always kept ready for emergencies. This plant is the manufacture of Tangyes, of Birmingham.

Boilers.—There is a battery of twelve Lancashire boilers fired by Proctor's Automatic Stoking Gear. They are arranged in pairs, and work through six iron chimneys lined with brick. Foundations have been put in, and coal bunker provision made, for six additional boilers. The mill furnace boilers are of the vertical type, with one internal flue fitted with cross tubes, and they stand upon cast iron columns, so that the furnace necks are conveniently taken between the columns, towards the boilers. All the Lancashire and mill boilers are designed to carry 100 pounds per square inch, and in daily working they are pressed to 80 pounds. All the steam pipes from 9-in. diameter upwards are made from Siemens mild wrought steel in lengths up to 16 ft., welded from end to end, with solid flanges contracted and rivetted on. The boilers, steam and feed pipes, are covered with a non-conducting material, all secured by canvas binding neatly stitched on. The Lancashire boilers were made by Adamson & Company, of Manchester; and the mill boilers by Foster & Sons, of Preston; the steam pipes were made by Thomas Piggott, Birmingham; while the Fossil Meal Company supplied the boiler and pipe covering.

Live Roller Gear, Billet Shears, and Hot Sawing Machines.—As previously described, a complete system of live roller gear is arranged between the bloom shear and the 32-in. mill on the receiving side, and also on the delivery side as far



BAR BANK.

as the first and second saws, the first saw being 175-ft. from the mill and the second one 275-ft. A similar system is attached to the 22-in. mill, with high-pressure reversing driving engines, shafting and mitre gear complete for the three systems, and all made by Taylor & Farley, of West Bromwich. One vertical billet scrap cutting shear for the 32-in. mill, and a similar shear for the 22-in. mill, arranged with improved stop motion and falling tables, were made and erected by Buckton & Company, of Leeds, which firm also made a smaller machine for the 12-in. guide mill, but without a falling table. The two circular sawing machines for the 32-in. mill, and that for the 22-in. mill, have each 5-ft. saws; that connected with the 12-in. mill is 3-ft. 6-in., and being specially arranged for fish plate cutting. The machines are of the vertical type, and the saws are hung in pendulum frames actuated by hydraulic power. All the saws were made by Davy Brothers, of Sheffield.

The Bar Bank is arranged at the south end of the Mills, one-third being covered by the roof. Bar skidding gear is provided, worked from the driving engine through shafting, and the friction cones being set in motion by hydraulic rams. The arrangement is such that one range of skids may be working independently of another, and in either direction; and this system is adopted at Consett in preference to that whereby each range of skids is supplied with its driving engine, such an arrangement interfering with loading operations. The loading on the bank is done by two 3-ton steam travelling cranes, having 30-ft. jibs, each driven by one man. The bar bank skidding gear was made and

erected by the Teesside Iron and Engine Works Company, and the two cranes by Thomas Smith, of Rodley. In making this bar bank, a large retaining wall had to be built on the north side of the road leading from the Company's General Offices to the Slag Bridge, where it is 30-ft. above the level of the road. Not far from this bridge a buttress is inserted, so that at any future time a bridge may be thrown across the highway. In completing this scheme, the workmen's cottages now forming Staffordshire Row will be pulled down, a second retaining wall built parallel with the south side of the road, and the ground beyond all levelled up, which will give increased facilities for the loading and stocking of bars. The excavating, concreting, and brick and mason work, connected with the mills, were mostly carried out by contract with Mr. T. D. Ridley, of Redcar. The whole of the new Angle Mill plant was designed by the Company's mill engineer, Mr. James Scott.

ENGINEERING SHOPS.

In connection with the Works are the usual Engineering shops, namely, fitting, blacksmith, boilersmith, pattern maker, joiner, and other shops, where the necessary renewals and repairs to machinery and other plant are executed for the collieries, blast-furnaces, melting shops, forges, and rolling mills. It has been found, however, that the capacity of these shops is somewhat limited to meet the increasing demands of the Works, and new premises of a more commodious and modern character are contemplated.

FOUNDRY.

This is situated at Crookhall, about a mile from the main Works, and has a capacity of 150 tons of castings per week. The foundry plant consists of three cupolas, air furnace, drying stoves, loam mill, and necessary blowing plant, with two steam jib cranes, one 25-ton overhead steam crane, and one hand power jib crane. The ingot moulds, and the whole of the castings necessary for mill and general iron work repairs, are made here. Connected with the place are pattern and blacksmiths' shops, and a brass foundry. Two egg-ended boilers drive the machinery. The overhead crane was made by Booth Brothers, and Thwaites Brothers, of Bradford, supplied the Roots patent blowers.

BRICK WORKS.

THESE are south-east of and about half-a-mile from the Iron and Steel Works, and have a capacity of about 120,000 bricks per week. Ordinary fire bricks, blastfurnace lumps, and other fire brick articles used in the various departments, are made here, the coal and clay being obtained at the Delves Pit, which is in close proximity. The clay is taken up incline gears by steam power, and tipped automatically into a large iron shoot provided for its reception. It is then conveyed along a horizontal shoot worked by an Archimedean screw to a large edge-runner mill, where it is ground. It next passes through perforated plates in the mill pan, after which it is elevated and screened, and finally passed to the pug mill. The driving engine, mill, and elevating gear are of great strength and power. There are ten brick burning kilns, equal to 17,000 or 18,000 bricks per charge. The kilns are fired by the waste heat from four rows of coke ovens immediately adjoining, the waste gases from which are collected in one large flue, and after passing through the kilns are conveyed in small flues under the floor of the commodious drying shed. There are also a small mill and press for mixing and making ganister bricks, which are burnt in two suitable hard fire kilns, each having a capacity of 10,000 bricks.

Steam is obtained from a Lancashire boiler also fired by the refuse heat from the coke ovens. The whole works,

including coke ovens, cover an area of fifteen or sixteen acres, and were designed by and erected under the superintendence of the late Mr. Jno. P. Roe. The building consists of mill house and drying shed, and there is room for extension if necessary. Two chimneys 150ft. high draw the heat through the kilns and under the drying flats.

LABORATORY AND TEST HOUSE.

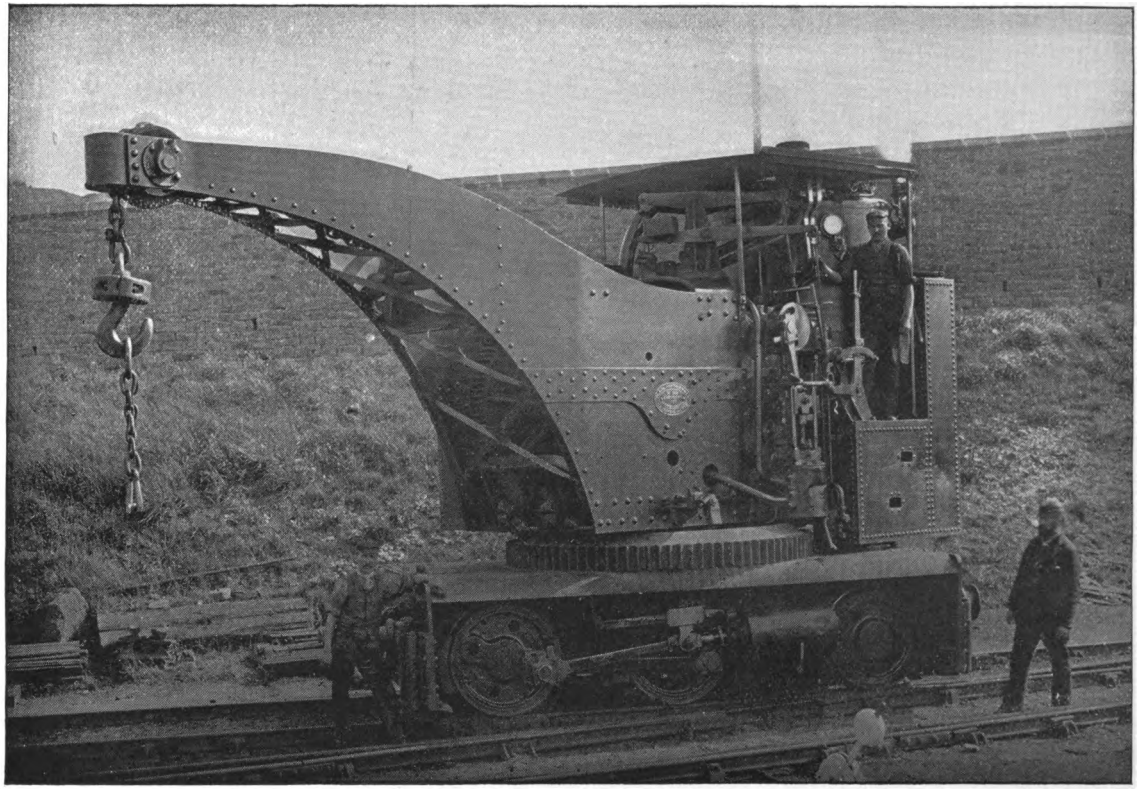
Laboratory.—The Works possess a well equipped and convenient chemical laboratory, with necessary apparatus for the examination of materials received and produced in the operations connected with the various manufacturing processes.

Test-House. — This contains three Buckton's testing machines, one of 100 tons capacity, and two of 50 tons each, two tensile test preparing machines, two powerful bending machines, drilling machine, emery wheel, and all necessary appliances for carrying out the tests required by Lloyds, Bureau Veritas, Board of Trade, Admiralty, and other surveys.

LOCOMOTIVES & LOCOMOTIVE CRANES.

THE locomotives and locomotive cranes are for convenience divided into classes, the locomotives into A B C, and the locomotive cranes into D and E, the entire number

in use being forty-three. Of the locomotives, the **A** class, six in number, are the most powerful, having all six coupled wheels. Four of them have cylinders 16-in. diameter by 24-in. stroke, with wheels 3-ft. 11-in. diameter. The other two have cylinders 17½-in. diameter by 25-in. stroke, with wheels 4-ft. 2-in. diameter. They are all inside cylinder tank engines, and were built by Kitson & Company, of Leeds. Each weighs about 36 tons, and they are chiefly used in working the traffic between the collieries and the works, and hauling the ore to the blast-furnaces. The **B** class are outside cylinder tank engines, weighing about 25 tons, with four coupled wheels 3-ft. 4-in. diameter, the cylinders being 12-in. diameter by 19-in. stroke. They are used principally about the mills for shunting purposes and delivering the steel and iron, &c., on to the North-Eastern Railway. They have been built by various makers, namely, Black, Hawthorn, & Co., Gateshead Robert Stephenson & Co., and Hawthorn, Leslie, & Co., Newcastle-on-Tyne; and John Harris, Darlington. The **C** class, four in number, are tank engines of a similar design to the **B** class, having outside cylinders 9-in. diameter by 16-in. stroke, and four coupled wheels 2-ft. 10-in. diameter. They are used exclusively about the blast-furnaces, and were built by Black, Hawthorn, & Co. The **D** locomotive cranes include three types built respectively by Dûbs & Company, Glasgow (four); Black, Hawthorn, & Co. (one); and T. Smith, of Rodley (three). The Dûbs cranes are outside cylinder tank engines, on four coupled wheels, 3-ft. 6-in. diameter, the locomotive cylinders being 12-in. diameter by



E LOCOMOTIVE CRANE.

22-in. stroke, and weigh about 36 tons. The D crane, equal to a load of two tons, built by Black, Hawthorn, & Co., was the first put to work here having the vertical type of boiler. The three D cranes built by Smith, of Rodley, are derrick cranes of the usual type, and capable of lifting a load of 30 cwt. at 30-ft. radius, or 60 cwt. at 15-ft. radius. The E cranes are the largest, and were designed and built specially for these works. Nos. 1 and 2 each lift 12 tons at a radius of 16-ft. Nos. 3 and 4 lift 7 tons each at a radius of 15-ft., while Nos. 5, 6, and 7 lift the same weight at a similar radius, but have longer jibs, which can be raised or lowered by a derrick motion till the radius is 20-ft., at which they lift 5 tons without being clamped down or otherwise supported. They all lift the weights on a single chain, and are very quick in the various motions. They have vertical boilers, with "Field" tubes, which are fixed on the tail of the jib, so as to act as a counterpoise to the weight lifted. E 1 and 2 are the largest, lifting easily and carrying the load of 12 tons. In working order they weigh (exclusive of the load lifted) about 55 tons. They were the first of the kind built, and were designed by the late Mr. J. P. Roe, the details being worked out under his supervision by the builders, Black, Hawthorn, & Co. They consist of a bottom carriage forming the locomotive, with outside cylinders 13½-in. diameter by 21½-in. stroke, on three pairs of wheels, two pairs, 3-ft. 0-in. diameter, being coupled, and the front pair, 2-ft. 9-in. diameter, fitted with radial axle-boxes, to enable the engine to go round sharp curves. On the centre of this carriage is bolted the crane

pillar, and spur rack and roller path on which the crane revolves. The lifting and revolving motions are worked by one pair of engines fixed on the jib sides. A powerful brake sustains the load at any point. The lifting, revolving, and travelling may be, and frequently are, carried on simultaneously. The driver stands on the jib by the side of the boiler, where he can see the load he is lifting, and has full control of all motions without moving from his place. Steam is conveyed to and from the locomotive cylinders through the centre pillar, down which also passes the locomotive reversing and brake rods. **E** 3 and 4, built respectively by Black, Hawthorn, & Co., and Cowans, Sheldon, & Co., of Carlisle, are somewhat similar to Nos. 1 and 2, but smaller, lifting a load of 7 tons, and travelling with it suspended to the jib. The locomotive carriage is mounted on four coupled wheels, 3-ft. 0-in. diameter, and has cylinders 12-in. diameter by 21½-in. stroke. The driver's platform in these two cranes is underneath the jib, and extends the full width of the crane, giving him ample room. He may also work the crane from whichever side of the platform he finds most convenient, duplicate handles for all the various motions being placed at each side. In addition to the pair of engines on the sides of the jib for lifting, is another pair for working the revolving motion through worm gearing. No. 3 has also a chain drum on each side of the locomotive carriage, to be used for hauling purposes when necessary, and worked by a small pair of engines. **E** 5, 6, and 7, built by Black, Hawthorn, & Co., are of similar size and capacity to Nos. 3 and 4, but have in addition a derrick

motion worked from the lifting engine, for raising and lowering the jib, which is somewhat longer than on the other two cranes, and enables weights to be lifted at any radius between 15-ft. and 20-ft. Besides the motions enumerated, all the E cranes have a quick running shaft, driven by the lifting engines, which is attached to the tilting gear of the steel casting ladles when they need tilting up in the carriages. These large cranes are used almost exclusively in the steel melting shops.

LOCOMOTIVE REPAIRING SHOP.

THE locomotive repairing shop is situated at Templetown, about a mile from the Works, on the main line between the Works and the collieries. It is 180-ft. long by 42-ft. wide, and contains store-house, smiths' shop, with four fires and large furnace for heating tyres, &c., machine shop, fitting shop, with two lines of rails and pits, and foreman's office. The machinery is driven by a Tangye's horizontal engine, supplied with steam from a Cornish boiler, and consists of drilling, shaping, and screwing machines, slide and screw-cutting lathes, and a wheel and tyre turning lathe, wheel press, &c. In the fitting shop is about to be erected an overhead crane, to lift up to 25 tons.

WAGON REPAIRING SHOPS.

EAST of the Works are the Wagon Shops, where all the chaldron wagons and coal and coke trucks are built and repaired. Within this establishment is also the staff of workmen kept for repairing the cottage and other property belonging to the Company. The Company have also an Engineering Shop at Bradley, where all the necessary repairs are effected to the tubs, engines, and machinery generally connected with the collieries.

CONCLUDING REMARKS.

Whilst the capabilities of the Consett Company as producers have gradually developed, there has been a proportionate extension of their cottage and other property in the district. They possess about 2,700 cottages at Consett, Blackhill, Leadgate, and the outlying districts, and employ upwards of 6,000 hands, the wages at present paid amounting to £8,000 per week, or £416,000 per annum. Besides having miles of railways of their own, they contribute to the North Eastern Railway Company in dues, the large sum of £150,000 annually. Their Infirmary, one of the most handsome buildings in Consett, contains sixteen beds, and is an inestimable boon to those who receive injuries in the works or mines. The educational needs of the workmen and their families have been also provided for, schools and reading rooms having been built at Consett, Blackhill, Leadgate, Allendale Cottages, and Langley Park.

Yours faithfully
W Jenkins.

From a Photograph by Debenham & Gould, Bournemouth.
Swan Electric Engraving Co.

DIRECTORS.

The present Directors of the Company are:—DAVID DALE, ESQ., West Lodge, Darlington, Chairman; C. W. C. HENDERSON, ESQ., The Ridings, Hexham, Vice-Chairman; H. T. MORTON, ESQ., Fenton, Wooler; THOMAS H. BAINBRIDGE, ESQ., Holmwood, Clayton Road, Newcastle; WILLIAM STOBART, ESQ., Pepper Arden, Northallerton; CHARLES PERKINS, ESQ., Gallowhill Hall, Newcastle; and MARK FENWICK, ESQ., Lambton & Co., Newcastle. Solicitor to the Company, MR. R. W. COOPER, Grey Street, Newcastle. MR. MORTON has been a member of the Board since 1869. He became Vice-Chairman in December, 1890, but resigned in August of the present year, when MR. HENDERSON succeeded him.

The foregoing is a brief sketch of the Consett Iron Works for the period of about half-a-century, from 1843 to 1893, and, as will be seen, the object has been to describe their origin, development, and present character.

The General Manager, MR. WILLIAM JENKINS, entered the service of the Company in October, 1869; and the heads of departments have grown, nearly the whole of them, with the place. They have all displayed great devotion, diligence, and skill, and to their co-operation with the General Manager largely is due the great transition which is observable in the increased volume of the operations of the Company during the past twenty-five years.

HEADS OF DEPARTMENTS.

Collieries.—Mr. W. H. Hedley, Mining Engineer for the home collieries, with Mr. J. H. Morris and Mr. C. F. Scott as Viewers. Mr. W. Logan, Mining Engineer for Langley Park and Garesfield, with Mr. J. R. Gilchrist as Viewer. Colliery Engineer, Mr. James Turnbull.

Coke Manufacture.—Mr. W. Keenleyside, Manager.

Blast-furnaces.—Mr. C. P. Douglas, Engineer for Construction and Maintenance of Plant. Mr. John Kidd, Assisting Engineer. Mr. Geo. Ainsworth, Blast-furnace Manager. Mr. E. G. Kirkhouse, Assistant Manager.

Puddling and Iron Plates.—Mr. Thomas Siddell, Manager. Mr. Thompson Siddell, Assistant Manager.

Steel Ingot Making.—Mr. Geo. Ainsworth, Manager. Messrs. J. Petherick and Lewis Matthews, Assistant Managers. Messrs. J. R. Williams and Thomas Green, Sub-Managers.

Steel Plates and Angles.—Mr. C. Parnaby, Manager. Mr. S. B. Evans, Assisting Manager at Angle Mills. Mr. Unett, Chief Roll Turner at Angle Mills. Mr. Daniel Williams, Assisting Plate Mill Manager.

General Engineering Department.—Engineer for Construction and Maintenance of Steel Works, Forges, Rolling Mills, &c., Mr. James Scott. Locomotive Superintendent,

MR. W. S. MACFEGGAN. Chief Millwright, MR. WM. KNIFTON.

Traffic Department.—MR. ROBERT TEASDALE, Manager.

Cottages and Wagon Building.— MR. LUKE BROWN, Manager.

Laboratory.—Analytical Chemist, MR. F. WALKER, F.I.C.

Architect.—MR. C. E. OLIVER.

GENERAL OFFICES.

THESE were erected in 1884 from designs made by MR. W. LISTER NEWCOMBE, F.S.A., of Newcastle. Having been found insufficient, a further extension is now being made.

General Secretary of the Company.—MR. RICHARD EVANS.

Secretary's Assistant.—MR. ROBERT PARK.

Chief Pay and Stock Clerk.—MR. JOHN HEYMER.

Chief Accountant.—MR. SEPTIMUS BRODIE.

Cashier.—MR. W. TILLEY.

Check Clerk.—MR. D. JONES.

SALE AGENTS.

The Company are represented by the following Agents at the places mentioned :—

Scotland.—MR. ANDREW DENNY TOLMIE, 166, Buchanan Street, Glasgow.

London and the South of England.—MESSRS. J. C. MOUNSEY & Co., 7, Lawrence Pountney Hill, London, E.C.

North-East Coast.—MR. THOMAS W. HODGES, 19, Grey Street, Newcastle.

Midland District.—MESSRS. CARRICK AND BROCKBANK, Manchester and Birmingham.

The illustrations in this little book are produced by the SWAN ELECTRIC ENGRAVING COMPANY. MR. DALE'S portrait is reproduced from one taken by MESSRS. ELLIOTT AND FRY, London; while that of MR. JENKINS is from a photograph by MESSRS. DEBENHAM AND GOULD, of Bournemouth. The whole of the views were photographed by MR. VENICE DUNN, of Consett.

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